YAMAHA

PMC1

PERCUSSION MIDI CONVERTER
CONVERTISEUR MIDI POUR PERCUSSIONS
SCHLAGZEUG MIDI-WANDLERS

OWNER'S MANUAL
MANUEL DE L'ACHETEUR
BEDIENUNGSANLEITUNG

ABOUT THIS MANUAL

Thank you for purchasing the PMC1 Percussion MIDI Converter. The PMC1 enables the percussionist to play synthesizers and digital percussion sounds from drum pads. It can be used in any number of ways, depending on your needs and imagination. This manual will explain how to operate the PMC1, and give some examples of how it can be used. In order to understand the PMC1 and take full advantage of its wide capabilities, please read through this manual and try out the examples.

CONTENTS

INTRODUCTION

The PMC1 Percussion MIDI Converter opens the possibilities of the Yamaha Computer-Assisted Music System (YCAMS) to the percussionist. It allows you to control tone generators, synthesizers and rhythm programmers from a set of responsive, natural-feeling percussion pads (PTT1 or PBD1, sold separately). Especially suited to the demands of live performance, the PMC1 provides an astounding range of flexibility and convenience. Here are just a few of its features.

|	
MIDI OUT A and B	Each pad transmits independently from two outputs, and can send different notes to two sound generators.
MIDI Channel	Each pad can transmit on a different MIDI channel, allowing you to to control 8 different synthesizers independently from each MIDI OUT.
Dynamic Note Shift	The transmitted note can be varied according to how hard you hit the pad.
Simul-Notes	A pad can be set to play up to 5 simultaneous notes for each hit, for a variety of sound layering and stacking effects.
32 Memories	Up to 32 completely different setups can be stored for recall at the touch of a button. An additional 32 can be stored in a RAM1 cartridge, giving you 64 setups. You can have a different drum set for each song (or even for each verse)!
8 Memory Chains	A chain of 20 memories can be programmed, and stepped through each time you press a footswitch. The PMC1 will store 8 chains of 20 memories each, a great asset in live performance.
RAM Cartridge Interface	In addition to saving and loading PMC1 memory, the cartridge interface can be used to save and load bulk voice and function data to and from other devices that have no cartridge slot (eg. TX7/816, DX21).
STOP!	Using the PMC1 effectively requires that you understand MIDI. If you are a little unsure about your knowledge of MIDI, go and read p.46 "What's MIDI?"

PRECAUTIONS

LOCATION
Avoid placing the PMC1 in direct sunlight or close to a source of heat. Also, avoid locations in which the device is likely to be subjected to vibration, excessive dust, cold or moisture.

HANDLING
Avoid applying excessive force to the switches, dropping or rough handling. While the internal circuitry is of reliable integrated circuit design, the PMC1 should be treated with care.

POWER CORD
Always grip the plug directly when removing it from an AC receptacle. Removing the plug from the AC receptacle by pulling the cord can result in damage to the cord, and possibly a short circuit. It is also a good idea to disconnect the PMC1 from the AC receptacle if you don't plan to use it for an extended period of time.

CARTRIDGE CARE
The RAM1 cartridges (sold separately) have no moving parts, other than their memory protect switches, nor do they have batteries. They should, however, be kept clean and dry to protect their connectors. They should also be kept away from strong electrostatic fields, as produced by sparking electric motors and solenoids, fluorescent lights, and so forth; as with all electronic memories, the data could be accidently altered.

CLEANING
Use only a mild detergent on a cloth, and dry with a soft cloth.
Never use solvents (such as benzine or thinner) since they can melt or discolor the finish.

ELECTRICAL STORMS (LIGHTNING)
Computer circuitry, including that in the PMC1, is sensitive to voltage spikes. For this reason, the PMC1 should be turned off and unplugged from the AC receptacle in the event of an electrical storm.
This precaution will avoid the chance that a high voltage spike caused by lightning will damage the device.

ELECTROMAGNETIC FIELDS
Computer circuitry is also sensitive to electromagnetic radiation.
Television sets, as well as radio receivers, transmitters and transceivers, and wireless microphone or intercom systems are all potential sources of such radiation, and should be kept as far away as possible.
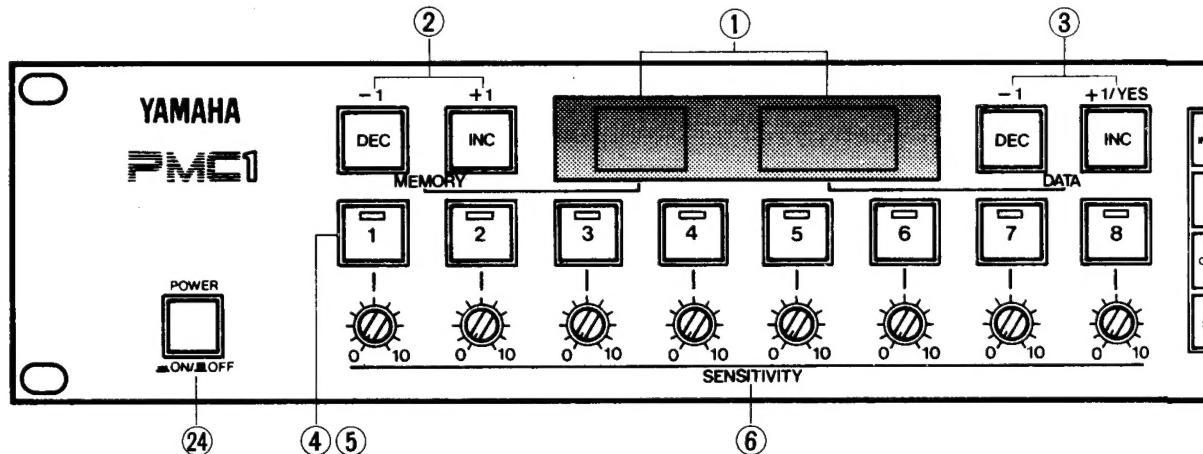
FRONT PANEL

① LED DISPLAY
The left side shows the memory number, and the right side shows a parameter setting.

② MEMORY SELECT
Select PMC1 memories 1-32 (internal or cartridge).

③ DATA INC/DEC
Change the setting of each parameter.

④ PAD SELECT 1-8
Select which pad you are editing.

⑤ PAD LED 1-8
Whenever a pad is hit, the corresponding LED will flicker. When editing, the pad LED shows which pad being edited.

⑥ SENSITIVITY 1-8
Adjust the sensitivity of each pad.

⑦ INTERNAL
Select internal memories.

⑧ CARTRIDGE
Select RAM cartridge memories.

⑨ LOAD/RECEIVE
Load PMC1 memory data from a RAM cartridge into the PMC1 or receive PMC1 memory from MIDI IN.

⑩ SAVE/TRANSMIT
Save PMC1 internal memory to a RAM cartridge or transmit PMC1 internal memory from MIDI OUT.

⑪ MIDI A/B
Switch between editing MIDI OUT A and B of each pad.

⑫ CHAIN
Program a chain of PMC1 memories to be stepped through each time you press a footswitch.
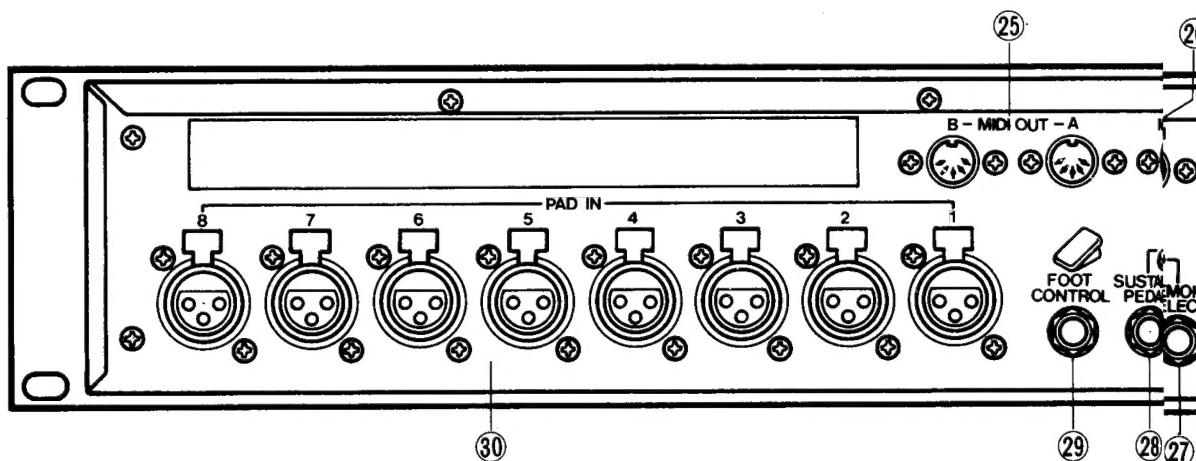
REAR PANEL

㉕ MIDI OUT A/B
The output of each pad can be independently set for each MIDI OUT.

㉖ MIDI IN
Receives Program Change messages for the PMC1, and bulk data of all types. Messages received here are sent out unchanged from MIDI OUT (merged).
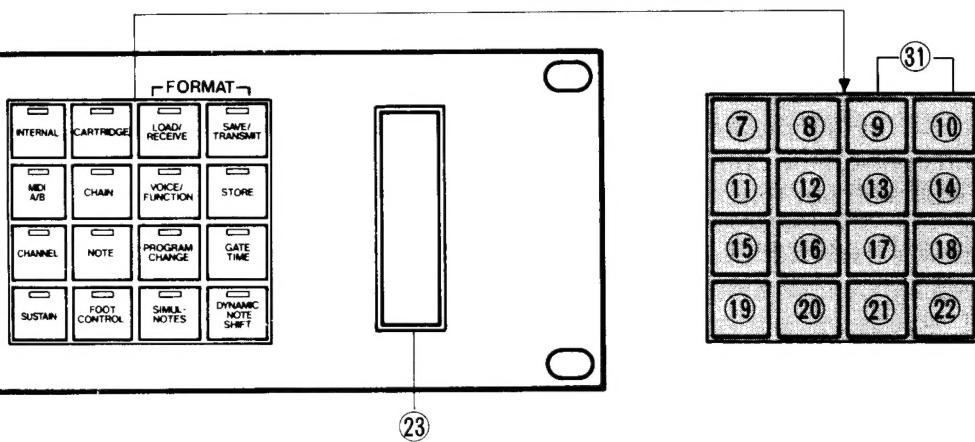
⑬ VOICE/FUNCTION
Send or receive voice or function data directly between a RAM cartridge and another device (eg. DX or TX).

⑭ STORE
Store the currect settings in a memory.

⑮ CHANNEL
Select the MIDI channel that each pad will transmit for outputs A and B.

⑯ NOTE
Specify the note(s) each pad will send.

⑰ PROGRAM CHANGE
A MIDI Program Change message can be sent from each pad's channel whenever a PMC1 memory is selected.

⑱ GATE TIME
Specify how long each note is to sound.

⑲ SUSTAIN
Choose whether a pad will be affected by the Sustain Pedal.

⑳ FOOT CONTROL
Specify how a pad will be affected by the Foot Controller.

㉑ SIMUL-NOTES
A pad can be set to produce up to 5 notes for each hit.

㉒ DYNAMIC NOTE SHIFT
You can specify a different note to be played depending on how hard you hit the pad.

㉓ CARTRIDGE SLOT
Data can be saved to or loaded from a cartridge.

㉔ POWER SWITCH
The LED display indicates power on, so there is no separate power indicator.
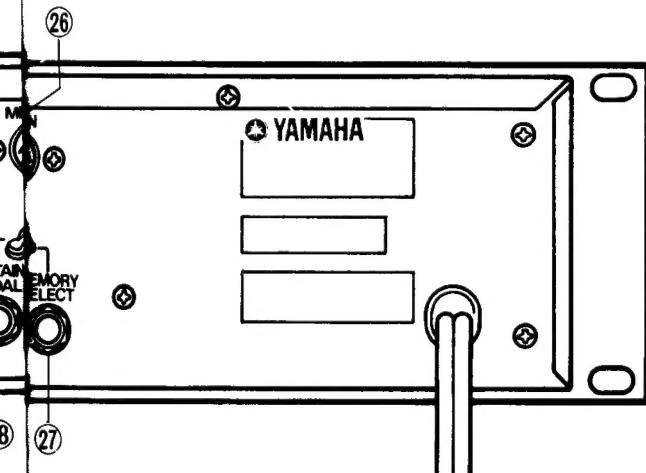
㉗ MEMORY SELECT
A footswitch can step through PMC1 memories in a pre-programmed chain.

㉘ SUSTAIN PEDAL
A footswitch can delay each pad's Note Off message.

㉙ FOOT CONTROL
A continuous-type foot pedal (FC7) can control Pitch Bend or Modulation independently for each pad.

㉚ PAD INPUTS 1-8
Connect PTT1 Percussion Pads to these inputs using the XLR mic cables included with the pads.

㉛ Press these two switches together to format a cartrige.

CONNECTIONS

The PMC1 will not produce sound by itself. Please use a MIDI cable to connect it to a sound source (eg. TX816 tone generator, DX7 synthesizer, RX rhythm programmer). To make full use of the PMC1's possibilities, we suggest that you purchase and connect the optional footswitches and foot controller. (Use only the Yamaha FC7 foot controller. The FC3A will not function with the PMC1.)

Connect PTT1 or PBD1 percussion pads to the pad inputs 1-8 using the XLR microphone cables included with the pads.
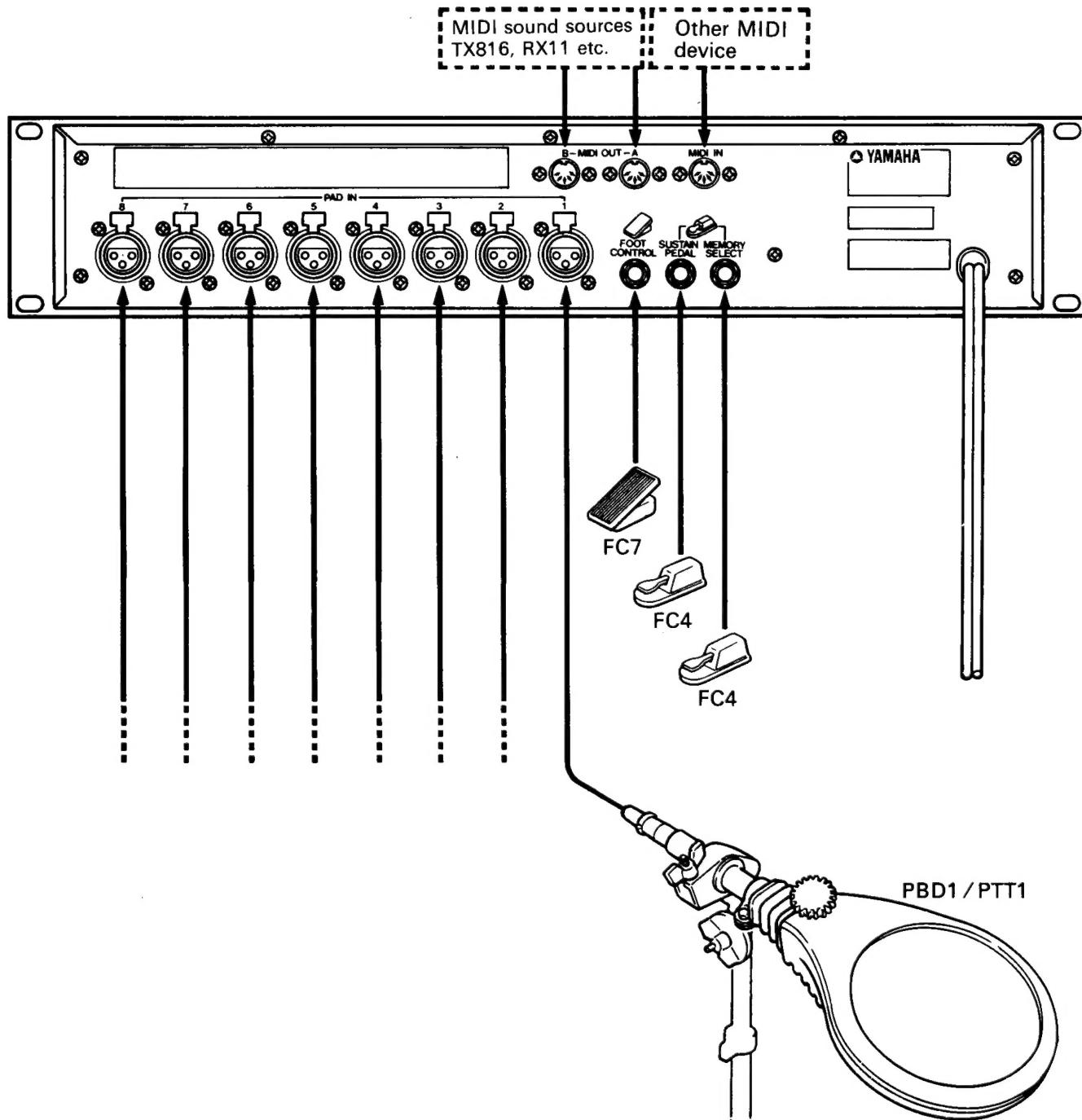
PAD SETUP/HANDLING

About the PBD1 / PTT1 percussion pads

The PBD1 (bass drum type) and PTT1 (all purpose type) percussion pads are specially designed to provide a natural feeling bounce-back. They are constructed of a one-piece (not laminated) variable-density synthetic material (sponge with a hard skin) over a wood base. The rim is die-cast aluminium, and is virtually indestructable. You can play the hardest rimshots you like without damaging it. (Of course, rimshots will not sound any different than direct hits.) The cable connectors are locking XLR types, and will not accidently fall out under any conditions. The completely adjustable ball joint lets you set the pad at any desired angle.

Setup

Adjust the angle of the pad and tighten the knob. Connect the pad to the PMC1 using the included XLR microphone cable. (Be sure to push the cable connectors in until they lock.)
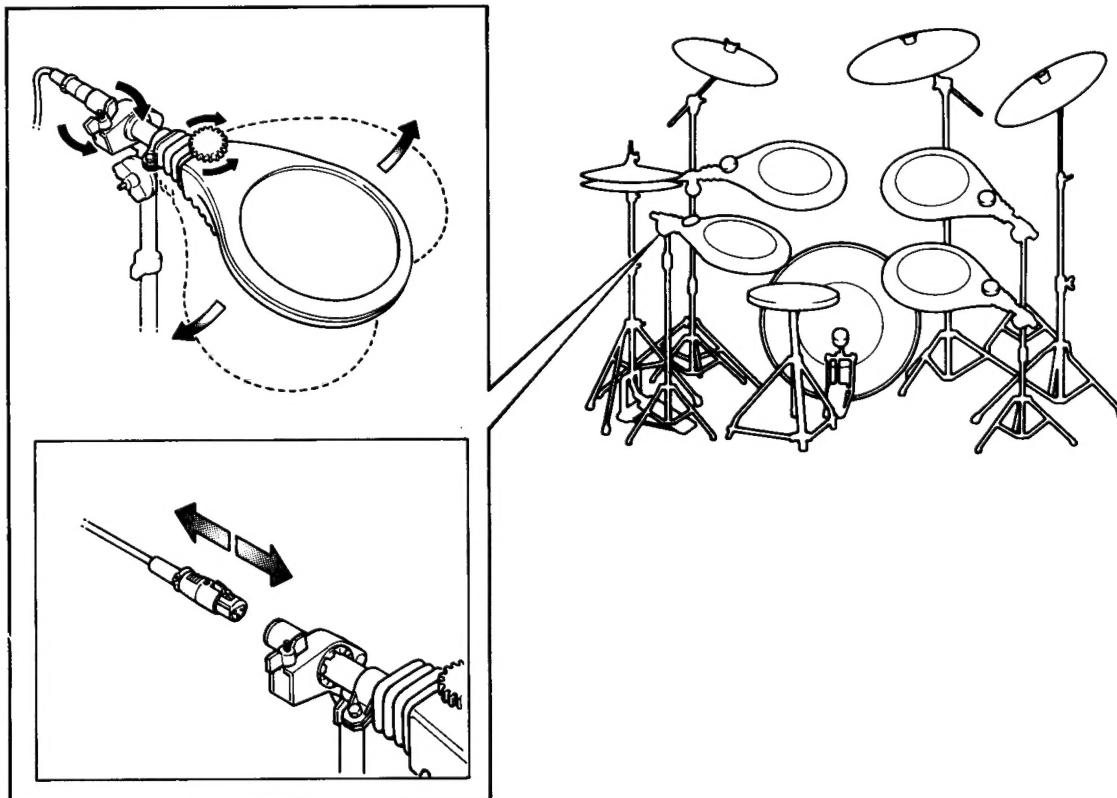
Precautions

● Although the PBD1 / PTT1 is of very durable construction, treat the skin surface with care as you would with an acoustic drum.

● Avoid placing the PBD1 / PTT1 in direct sunlight or close to a source of heat.

● If the skin surface should be accidently cut by a sharp object, it can be replaced by your Yamaha dealer.

HOW DOES THE PMC1 WORK?

The PMC1 is an interface that converts analog trigger signals from PTT1/PBD1 percussion pads into MIDI Note On messages. It has inputs for 8 pads and has 2 MIDI outputs. By hitting a pad, you can play a tone generator that is connected to a MIDI OUT. (The PMC1 will not make sound by itself. You will need to connect it to a MIDI tone generator such as the TX816 or DX7, or to a MIDI rhythm programmer such as the RX11.) Here is an example of a PMC1 system.

Electronic Percussion System
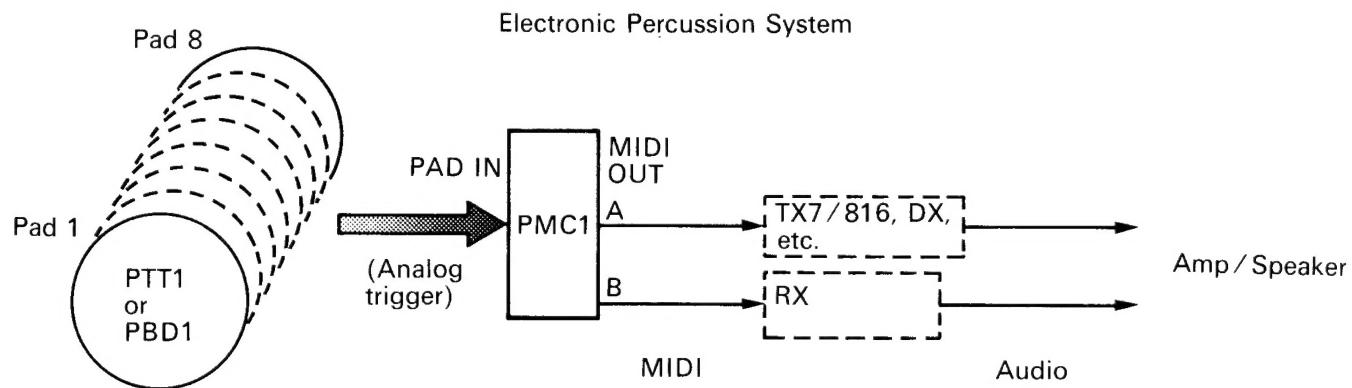
Each Pad Input can be programmed with a different Note Number, Gate Time, MIDI Channel, etc. for outputs A and B, and a complete setup of all 8 pad inputs can be stored in a memory. The PMC1 can store 32 setups in its internal memory, and another 32 on an external RAM cartridge (sold separately).

One PMC1 Setup (The Edit Buffer)
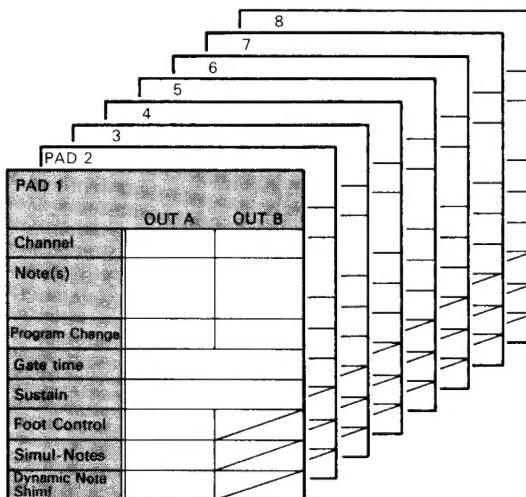
About MIDI OUT A and B

The PMC1 has two MIDI OUTs, A and B. Each pad sends messages from the two outputs, which are set independently. MIDI OUT A will transmit all functions. As you can see from the diagram of the Edit Buffer, MIDI OUT B will not send Foot Control, Simul Notes, or Dynamic Note Shift. This makes it especially suitable for connecting an RX rhythm programmer. (The RX has no way of handling Foot Control data such as Pitch Bend or Modulation.) However, there are some interesting ways to use Simul Notes and Dynamic Note Shift even with an RX. These advanced techniques will be covered on p.33.

SHORT OUTLINE OF OPERATION

Selecting Memories

You can select another setting at any time using the MEMORY [DEC] / [INC] keys. The selected memory number is displayed in the left of the LED display. Press INTERNAL or CARTRIDGE to choose which set of 32 memories you are selecting from (internal or cartridge). (If there is no cartridge inserted, you will get an error message when you select CARTRIDGE.)

Select memories

```
  -1     +1
 DEC    INC        ⎡ 32        ⎤
   MEMORY          ⎣           ⎦
```
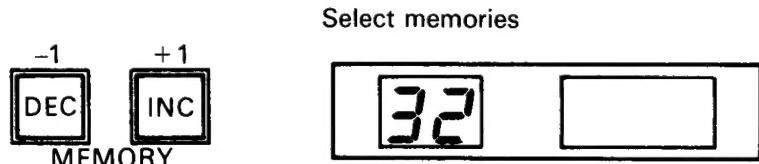
The Edit Buffer

You can make changes in the settings at any time, no matter which memory is currently selected. However, changes you make will not affect the actual stored in memory (internal or cartridge). When you select a memory, the data in the selected memory is loaded into a place called the Edit Buffer. This data tells the PMC1 how to behave. Changes you make will only affect the Edit Buffer, and are not permanent until you STORE the Edit Buffer into a memory (internal or cartridge). If you select another memory, the new data is called into the Edit Buffer and changes you have made will be lost (But you can recover them using Edit Recall, p.10).

How to Edit

1. Using MEMORY [DEC] / [INC] and INTERNAL or CARTRIDGE, select the memory you want to edit. The selected memory number is displayed, and the data is called into the Edit Buffer.

Which memory?

```
  -1     +1
 DEC    INC
   MEMORY
```
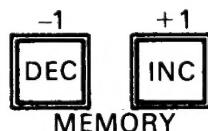
2. Press a Pad Select switch to choose which pad you will edit. The selected pad LED will light.

Which pad?

```
 [1] ------ [8]
```

3. Press MIDI A / B to select the output (A or B) you want to edit (LED constant for A, blinking for B).

Which output?

4. Press one of the pad parameter switches to choose the parameter you want to change. The selected parameter LED will light.

Which Parameter?
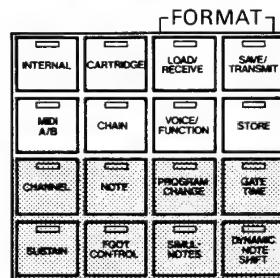
5. Use DATA [DEC] / [INC] to change the setting of that parameter. The selected setting will appear in the right of the LED display. (Once you have begun editing, a decimal point appears in the Memory Number display, indicating that it has been modified.)

Change data
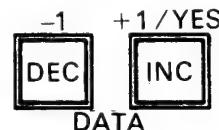
Next we give two simple setup examples. If you are using the PMC1 with a RX rhythm programmer as a sound source, turn to p.11. If you are using a DX synthesizer or TX tone generator, turn to p.13.

SIMPLE SETUP EXAMPLE USING RX

Here is an example to try out if you are using the PMC1 with a RX rhythm programmer. In order to give you an idea of how to operate the PMC1, we will show how to set up a pad to play a RX percussion voice.

Connections

As shown on p.6 use the XLR cable included with the pad to connect a PTT1 or PBD1 pad to pad input 1 on the PMC 1 rear panel. (If you have several pads already plugged in, no problem. This example will only use one pad.) Using a MIDI cable, connect the PMC1 MIDI OUT B to the RX MIDI IN.

RX Settings

The PMC1 will send a MIDI Note On message to the RX, causing it to produce sound, but the RX must be set to accept MIDI Note On messages. Set the RX to MIDI IN CHANNEL INFO AVAIL (see your RX owner's manual). Also, the RX reception channel must match the channel the pad is transmitting on. For this example, set the RX reception channel to 1. Check that the RX is connected to an amp/speaker system.

> **Note:**
>
> For RX11 and RX15 users:
> On the RX11 and RX15, Note Numbers for each instrument can be set by the user. In this example, we will assume that Instrument Note Numbers are set to the initial setting described on p.41. If not, your RX owner's manual tells you how to set or initialize Instrument Note Numbers.
>
> For RX21 and RX21L users:
> For the RX21/21L to accept Note Numbers, the LCD must be showing "CH INFO AVAIL".

PMC1 Settings

We will set Pad 1 to transmit a Note On message for the note F2 (Tom 1) from MIDI OUT B.

Select Pad 1-8

Press Pad Select 1 (the LED will light).

Select pad 1
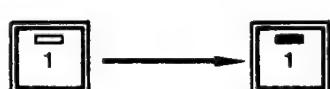
Select MIDI output A or B

The RX is connected to MIDI OUT B, so press MIDI A/B. The LED will start blinking, indicating that we are editing OUT B for this pad. (A continuously lit A/B LED indicates OUT A.)

Select MIDI out

OUT A (lit)   OUT B (blinking)
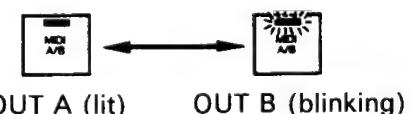
MIDI Channel

The RX is set to receive MIDI channel 1, so we will set pad to transmit on MIDI channel 1. Press CHANNEL once and the LED will light. (If you mistakenly press it twice, the LED will start blinking, so press it once again.) The right display shows the MIDI channel for pad 1. Press DATA DEC / INC to select a channel number 1-16 (in this example, channel 1.) Notice that as soon as you press DATA DEC / INC , a decimal point appears in the lower right of the memory number . This indicates that the data in the edit buffer has been changed (ie. it is no longer the same as the "original" memory data).

Select MIDI Channel

1 – 16
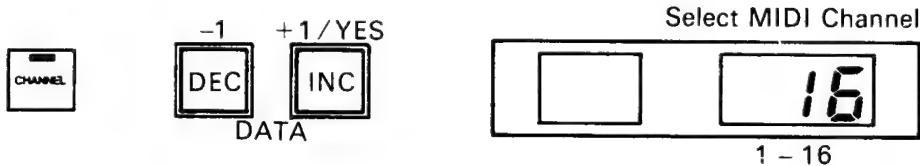
Note Number

The RX Tom 1 is triggered by an F2 Note On message. Press NOTE (the LED lights). The right display will show the curently selected Note Number for that pad (initial setting is C3). Press DATA DEC / INC to select F2.

Select Note

C -2 – G8
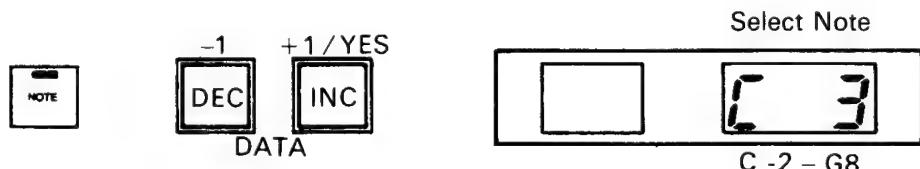
Try it out

Simple, wasn't it? When you hit pad 1 the RX Tom 1 should sound. If it doesn't, check the following points.

● Are you hitting the correct pad? When you hit a pad, the corresponding pad LED will flicker.

● Check SENSITIVITY for the pad. If it is set too low, you may not be hitting hard enough. Set SENSITIVITY to 12 o'clock position.

● Is the RX connected to a speaker? Tapping on a RX instrument key should make sound. If not, check RX Inst Level and audio connections from the RX.

● If it still doesn't work, go over this example once more from the beginning, making sure that the PMC1 MIDI transmit and RX receive channels are set correctly.

To learn how to store the setup you have just created, turn to p.15.

Store

SIMPLE SETUP EXAMPLE USING TX

Here is an example to try out if you are using the PMC1 with a TX tone generator or DX synthesizer. In order to give you an idea of how to operate the PMC1, we will show how to set up a pad to play a TX or DX voice.

Connections

As shown in the diagram on p.6, use the XLR cable included with the pad to connect a PTT1 or PBD1 pad to pad input 1 on the PMC1 rear panel. (If you have several pads already plugged in, no problem. This example will only use one pad.) Using a MIDI cable, connect the PMC1 MIDI OUT A to the DX/TX MIDI IN.

DX/TX Settings

The PMC1 will send a MIDI Note On message to the DX/TX, causing it to produce sound, but the DX/TX reception channel must match the channel the pad is transmitting on. For this example, set the DX/TX reception channel to 1 (see your owner's manual).
Check that the DX/TX is connected to an amp/speaker system.

PMC1 Settings

We will set Pad 1 to transmit a Note On message from MIDI OUT A to play a DX/TX voice.

Select Pad 1-8

Press Pad Select 1 (the LED will light).

Select pad 1

Select MIDI output

The TX/DX is connected to MIDI OUT A, Each time you press MIDI A/B, the A/B LED will alternate between constant and blinking. Press MIDI A/B so that the LED is constant (MIDI OUT A).

Select MIDI out


OUT A (lit)   OUT B (blinking)

MIDI Channel

The DX/TX is set to receive MIDI channel 1, so we will set pad 1 OUT A to transmit on MIDI channel 1. Press CHANNEL once, and the LED will light. (If you mistakenly press it twice, the LED will start blinking, so press it again.) The right display will show the currently selected MIDI channel for pad 1. Press DATA DEC / INC to select a channel number 1-16 (in this example, channel 1). Notice that as soon as you press DATA DEC / INC, a decimal point appears in the lower right of the memory number. This indicates that the data in the edit buffer has changed (ie. it is no longer the same as the "original" memory data).

Select MIDI Channel

`16`

1 − 16
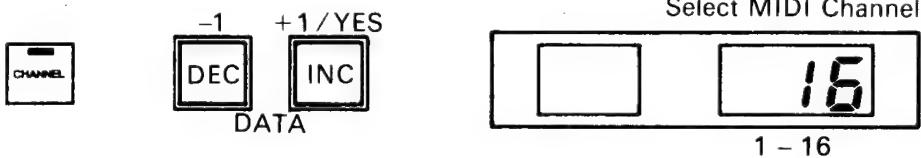
Program Change

Playing a DX flute voice from a percussion pad is not very exciting, so we will set a Timpani (or whatever) voice to be automatically selected whenever you recall this PMC1 memory. (Naturally, you will need to have a Timpani voice already in the DX/TX.) Press PROGRAM CHANGE once (the LED lights, not blinking). Use the DATA [DEC] / [INC] keys to select the Timpani voice. As you press the DATA [DEC] / [INC] keys, you will see the DX/TX memory numbers change. When you hit the percussion pad you should get sound.

−1   +1/YES

PROGRAM CHANGE   DEC   INC

DATA

Select Program Change

`128`

0 − 128
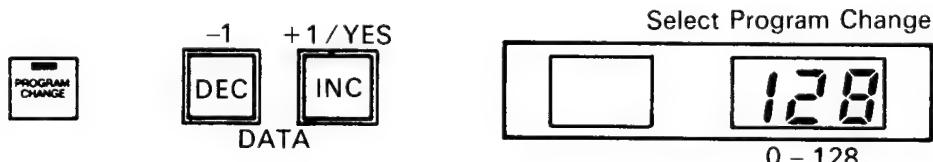
Note Number

However the Timpani may not sound very good when played on that note (initial setting is C3). Press NOTE, and the MIDI Note Number that the pad is producing will be displayed. (This will alternate with the Simul-Note number, but ignore it for now.) Use the DATA [DEC] / [INC] keys to select a note that sounds good for that percussive voice.

−1   +1/YES

NOTE   DEC   INC

DATA

Select Note

`C 3`

`15t`

(Ignore this display
for now.)

− 14 −
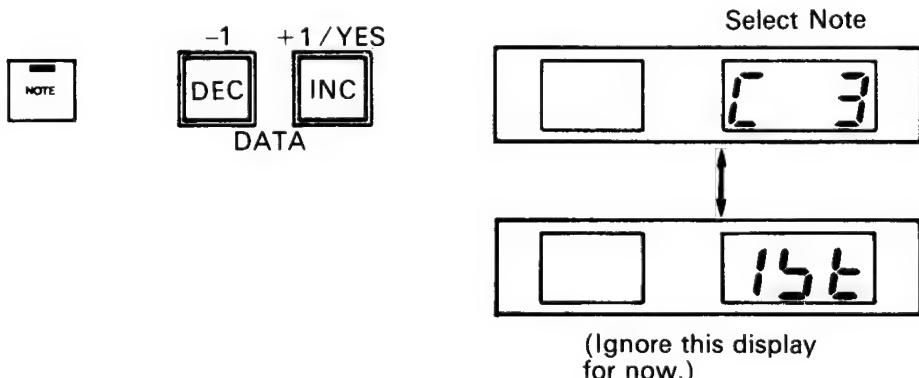
Try it out

That wasn't too difficult, was it? If it doesn't work as described above, check the following points.

● Are you hitting the correct pad? When you hit a pad, the corresponding pad LED will flicker.

● Is SENSITIVITY for the pad turned completely to the left? If it is too low, you may not be hitting hard enough. Set SENSITIVITY to 12 o'clock position.

● Is the DX / TX connected to a speaker? Try playing the DX from the keyboard (or the TX from an external MIDI keyboard.)

● Go over this example once more from the beginning, making sure that the PMC1 transmit and DX/TX receive channels are set correctly.

Store

Now we will store the new setting you have made. The decimal point in the lower right of the Memory Number LED indicates that you have made changes in the edit buffer. At this point, if you simply select another memory, new data will be called into the edit buffer and the settings you have just made will be lost. (You can restore this lost data using Edit Recall, p.31.) If you want to keep the new setting, you will have to STORE it.
Press STORE. The right side of the display shows "Str".
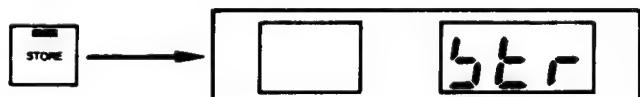
Using Memory DEC / INC , select the memory to store the current setting in. We want to store the current setup in internal memory, so make sure the INTERNAL LED is on. If you want to store it in the memory number that is already displayed, go on to the next step.

Store in which memory?

1 – 32
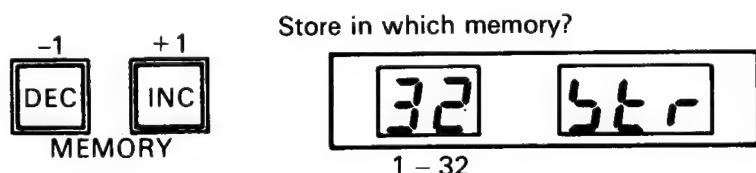
Press YES. All current settings will be stored in the selected memory. The STORE LED and the decimal point will go off. The right side of the display will go back to displaying the Note Number (or whatever you were doing before you STOREd).

+1/YES

OK to store in this memory

INC

```
32  5tr
```
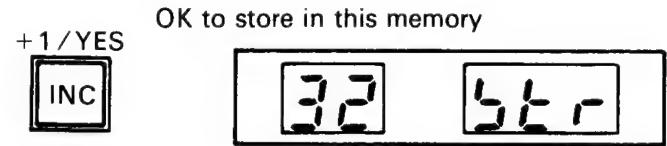
In later chapters (Advanced Setups, p.31) we will explain how to create a more useful setup, using all 8 pads. Since this example was meant to introduce you to the PMC1, we kept it simple. By now you should have a fairly good idea of how it works. Go on and read through the next sections "Pad Parameters", "Memory Functions", "Save / Load Other Data", and "Other Functions" to learn the full range of possibilities the PMC1 offers.

PAD PARAMETERS

Here we will explain in detail all functions that determine what each pad sends.

Pad parameters

```
                        ┌FORMAT┐
┌──────────┬──────────┬──────────┬──────────┐
│ ▭        │ ▭        │ ▭        │ ▭        │
│ INTERNAL │CARTRIDGE │ LOAD/    │ SAVE/    │
│          │          │ RECEIVE  │ TRANSMIT │
├──────────┼──────────┼──────────┼──────────┤
│ ▭        │ ▭        │ ▭        │ ▭        │
│ MIDI     │ CHAIN    │ VOICE/   │ STORE    │
│ A/B      │          │ FUNCTION │          │
├──────────┼──────────┼──────────┼──────────┤
│ ▭        │ ▭        │ ▭        │ ▭        │
│ CHANNEL  │ NOTE     │ PROGRAM  │ GATE     │
│          │          │ CHANGE   │ TIME     │
├──────────┼──────────┼──────────┼──────────┤
│ ▭        │ ▭        │ ▭        │ ▭        │
│ SUSTAIN  │ FOOT     │ SIMUL-   │ DYNAMIC  │
│          │ CONTROL  │ NOTES    │ NOTE     │
│          │          │          │ SHIFT    │
└──────────┴──────────┴──────────┴──────────┘
```
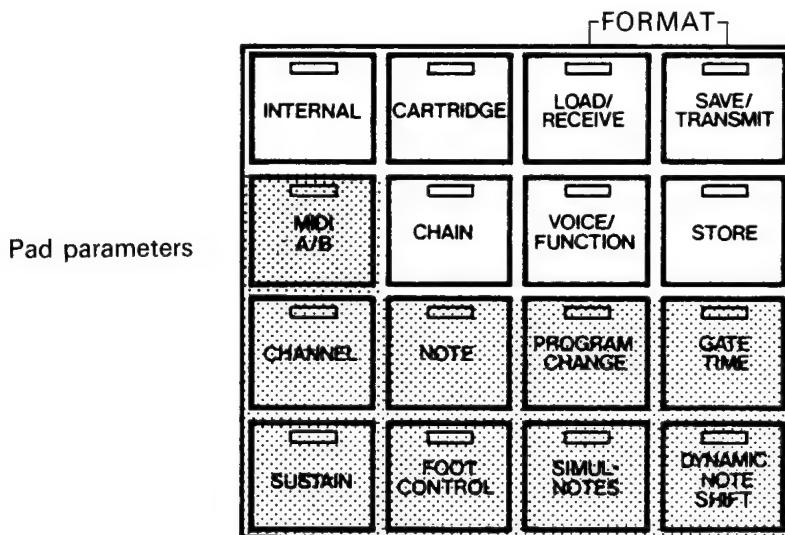
Pad parameter changes you make will only affect the edit buffer, and are not "permanent" until STOREd in a memory or RAM cartridge. As soon as you change a parameter, a decimal point will appear in the Memory Number display, indicating that the data in the edit buffer has been changed (ie. it is no longer the same as the "original" memory data). In this condition, if you press INTERNAL, CARTRIDGE or CHAIN, you will lose the changes you have made.

SENSITIVITY 1-8

These set the sensitivity of each pad. When the Sensitivity is 1, only a strong hit will trigger. When the Sensitivity is 10, even a soft touch will trigger. This is not a simple "threshhold" control, but rather affects the way the Note On velocity data is sent. Sensitivity is not memorized. (To have a different sensitivity for each setup would make things very difficult for the percussionist!) Whatever the knob indicates is always the current setting.

FFh

Transmitted velocity data

High Sensitivity

Low Sensitivity

01h

Soft   Strong
Force of hit
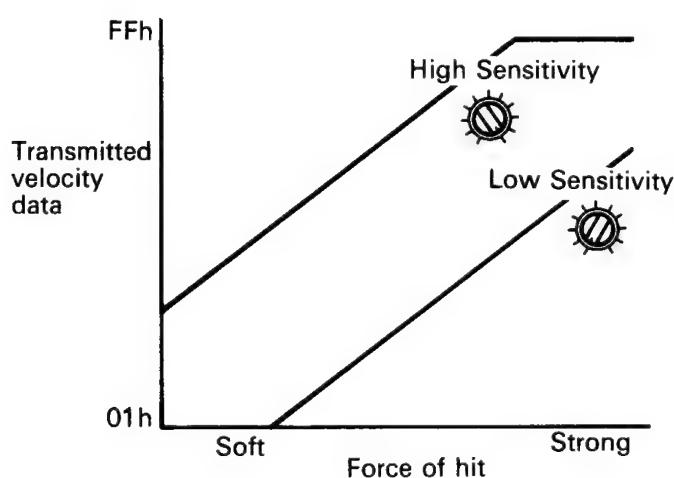
MIDI A/B

The messages that each pad sends from MIDI OUT A and B can be set independently. Each time you hit a pad, messages will be sent from both A and B. Pressing MIDI A/B will let you edit settings for A or B. Each time you press MIDI A / B, the LED will alternate between constant (OUT A) and blinking (OUT B). A shown below, some settings are shared by the two outputs.

PAD 1	OUT A	OUT B
Channel	①	①
Note	②	②
Program Change	③	③
Gate time	④	
Sustain	⑤	
Foot Control	⑥	
Simul-Notes	⑦	
Dynamic Note Shift	⑧	

① Which MIDI channels will this pad transmit on? (1 – 16)

② Which note(s) will this pad send from each output? (C-2 – G8)

③ Which Program Change messages will be sent when this setup is selected? (0 – 128)

④ How long will notes produced by this pad be held? (1 – 255)

⑤ Will the Sustain footswitch affect this pad?

⑥ What kind of MIDI messages will the Foot Control send on this pad's channel A? (Off, pitch Bend Up, Pitch Bend Down, Modulation)

⑦ How many simultaneous notes will this pad send on channel A? (1 – 5, Touch on / off)

⑧ How will the force of the pad hit shift the note number or add additional notes transmitted on channel A? (Range (0 – 12), Step (–12 – 12))

The two MIDI outputs are exactly the same except that MIDI OUT B will not send Foot Control, Simul Notes, or Dynamic Note Shift. If MIDI OUT B is being edited (the MIDI A/B is blinking), pressing these three will have no effect, and their LEDs will not light. Think of MIDI OUT B as a "simplified" output. It is perfectly possible to connect a RX to MIDI OUT A, but the RX has no way to deal with Foot Control data. (A RX ignores Pitch Bend and Modulation messages.) However, there are some neat things you can do with an RX using Simul-Notes and Dynamic Note Shift, and we will discuss these in the Advanced Setups (p.31)

CHANNEL

This lets you set the MIDI transmission channels (A and B) for each pad, and the MIDI transmission/reception channel for the PMC1 itself.

Pad Channel

When pressed once, the LED will light, and the MIDI channel for the selected pad will be displayed. Press the Pad the Pad Select switches to see the MIDI channel for each pad, and use DATA DEC / INC to change the setting. Suppose you are using a TX816 as the sound source, and have in each module 1-8 thirty-two Bass Drum voices, thirty-two Snare voices, thirty-two Lo Toms, etc... (yes, this is a bit extreme). You would set each module to receive a different MIDI channel, and set pads 1-8 to transmit on those channels. Each pad would then have its own independent tone generator. (When using a RX, different voices are played by different Note Numbers, and all pads would have to transmit on the same channel.)

Obviously if several pads are sending the same note on the same channel, things will get confused.

(Press once-lit) DATA

Select MIDI channel (pad)

`16`

1 – 16
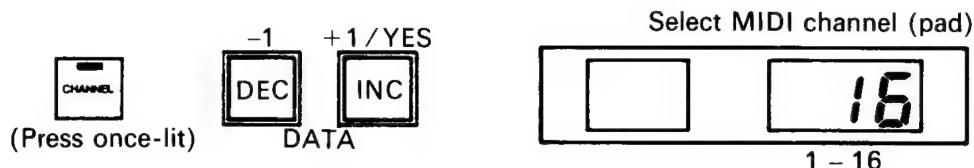
System Channel

Press CHANNEL again and the LED will start blinking. Now the display shows the System Channel for the PMC1 (channel number for the entire unit, often called the Device Number). Obviously, this is the same no matter which pad you select. The System Channel is the MIDI channel on which the PMC1 itself will receive Program Changes, causing it to switch memories. The System Channel applies to all memories, and switching PMC1 memories will not change it.
If you wanted to select PMC1 memories from an external MIDI device connected to PMC1 MIDI IN, you would match the PMC System Channel with the channel of the transmitting device. When receiving bulk data via MIDI, the incoming data must have a device number matching the PMC1 System Channel number (see p.50).
The System Channel also determines on what channel a System Program Change is sent (see p.21).

Select MIDI channel (system)

```
 -1    +1/YES
DEC    INC
   DATA
```

(Press again-blinking)

```
|  |  | 16 |
```

1 – 16
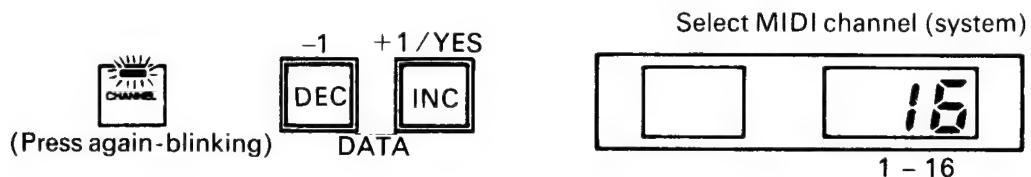
NOTE

Each pad can be set to transmit a specific Note Number(s). Notes are indicated with flats (b), and a decimal point indicates a minus octave.

```
 -1    +1/YES
DEC    INC
   DATA
```

NOTE

Select note

```
|  |  | C 3 |
```
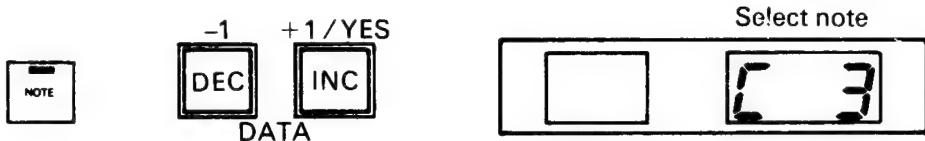
Display

| C .2 | ... | C 3 | db3 | d 3 | Eb3 | ... | G 8 |

| Note | C-2 | C3 | Db3 | D3 | Eb3 | G8 |

Only a single Note Number can be selected for MIDI OUT B. However if you are editing MIDI OUT A, the Note Number will alternate with the Simul-Notes Number. If you have set Simul-Notes to 2-5 (see p.23), each press of NOTE will step through the Simul-Notes (1st, 2nd, 3rd, 4th, 5th). Simul-Notes will be discussed on p.23.

NOTE (Press repeatedly)

| 1st | 2nd | 3rd | 4th | 5th |
| ↕ | ↕ | ↕ | ↕ | ↕ |

Displayed alternately with the note number
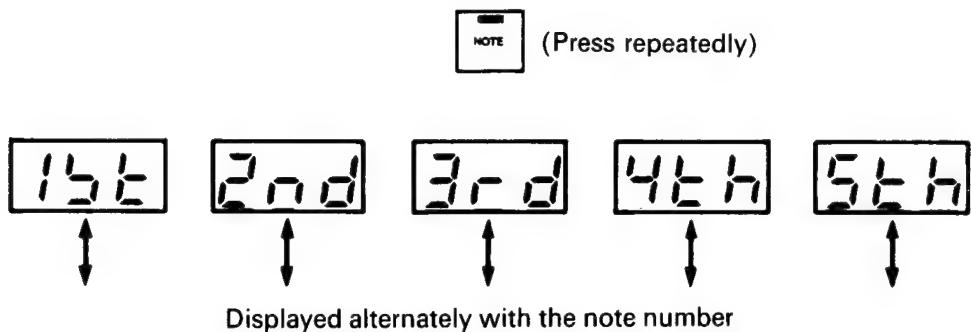
Note Number with RX

When using the PMC1 with a RX, the Note Number will determine the instrument (Bass Drum, Snare, etc.). For the Instrument Note Numbers in your RX, see the table on p.41.

Note Number with DX/TX

When using the PMC1 with a DX/TX or "keyboard type" synthesizer, the Note Number will determine the actual note or pitch that is sounded. Most percussive voices sound best in a certain range of the keyboard. Find the best-sounding spot by hitting the pad while using DATA DEC / INC to move through the notes.

PROGRAM CHANGE

Pad Program Change

This allows you to specify two Pad Program Change messages (A and B) for each pad, and one System Program Change message to be sent whenever this PMC1 memory is selected.

Pressed once, the LED will light, and you can specify a MIDI Program Change number (A and B) for each pad. These will be sent on the pad's channels whenever the PMC1 memory is selected. Used the DATA [DEC] / [INC] switches to select Program Changes 0-128. If you don't want to send a Program Change, select 0, and nothing will be sent.

This is useful when you are using a DX or TX (a RX ignores Program Change messages). It lets you completely change the sound of your entire drum set by selecting a PMC1 memory. For example, if you want pad 1 (transmitting on channel 1) to play a Timpani voice and pad 2 (transmitting on channel 2) to play a Gong voice, set the corresponding respective voice number in the Program Change for each pad. When you select that PMC1 memory, the tone generator receiving MIDI channel 1 will select the Timpani sound and the tone generator receiving MIDI channel 2 will select the Gong sound.

Select program change (pad)

-1 +1/YES

[PROGRAM CHANGE]   [DEC] [INC]

(Press once-lit)   DATA

| | **128** |

0 – 128
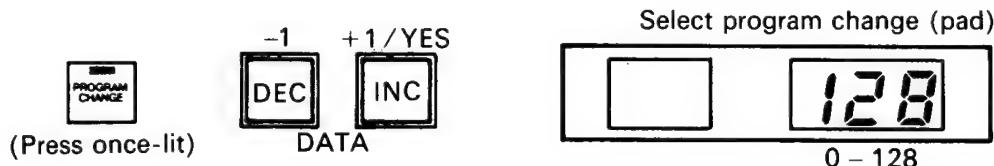
System Program Change

Press PROGRAM CHANGE twice and the LED will begin to blink, allowing you to set the System Program Change number for that memory. The System Program Change will be sent on the System Channel (see p.19). This could be used to switch memories on an effects unit such as the SPX90, selecting a different effect for each PMC1 setup. You can set one System Program Change for each PMC1 memory.

Select program change (system)

-1 +1/YES

[PROGRAM CHANGE]   [DEC] [INC]

(Press again-blinking) DATA

| | **128** |

0 – 128
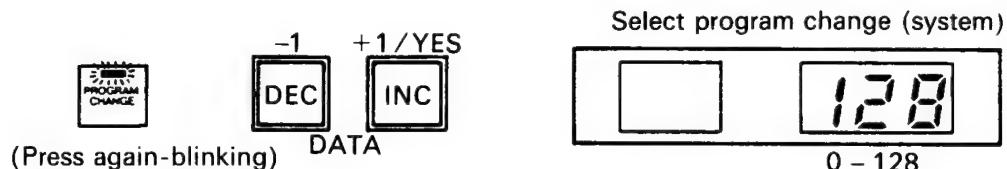
If two or more pads are transmitting on the same MIDI channel, only the Program Change of the lower numbered pad will be sent. The System Program Change has the highest priority.

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GATE TIME

If the PMC1 sent only Note On messages, the 16-note capability of the DX /TX would soon be used up, and further notes would not be sounded. So, for each Note On, the PMC1 automatically sends a Note Off. Gate Time sets the time from when you hit the pad to when the PMC1 sends a Note Off message. In other words, Gate Time is the "length" of the note. Use the DATA [DEC] / [INC] switches to select the time over a range of 1 to 255 (initial setting is 100). Gate Time applies to both MIDI outputs.

Select gate time

1 – 255
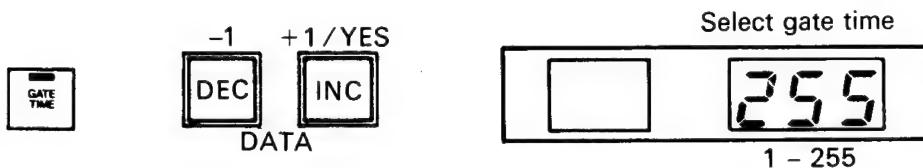
SUSTAIN

Since precise control is important especially during the attack of the note, the steps begin with millisecond intervals and get longer. Percussive voices can sound entirely different with a slightly longer or shorter gate time. An obvious example is the DX Timpani. When you press and quickly release the key (short Gate Time), the Timpani decays naturally. When you press and hold the key (longer Gate Time), the Timpani will be muted. If you hit a pad before the Note Off from the previous hit has been sent (especially possible with a long Gate Time), a Note Off will be immediately sent, and then the new Note On will be sent.

You can use a on/off type footswitch connected to the rear panel Sustain jack to hold a note that has already been hit. When you press it, the PMC1 will stop sending Note Off messages. When you release the footswitch, Note Off messages will be sent for all notes who's gate time has passed. Press SUSTAIN, and use DATA [DEC] / [INC] to turn each pad "oFF" or "on". Sustain On/Off applies to both A and B.

Select sustain

Sustain off   Sustain on
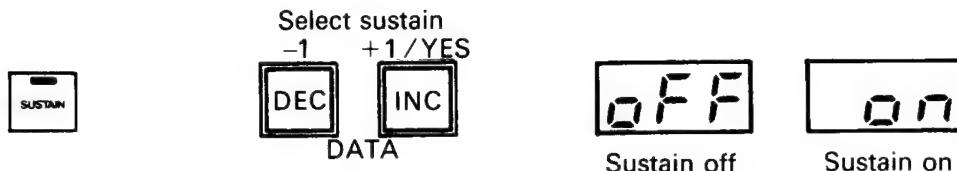
The effect Sustain has will differ according to the voice. For example if Sustain is used on the DX Timpani voice, the note will be muted, and decay quickly.

FOOT CONTROL

A pedal type foot controller connected to the rear panel jack can be used to send MIDI Pitch Bend (up or down) or Modulation Wheel messages from MIDI OUT A of that pad. Press FOOT CONTROL and use DATA [DEC] / [INC] to step through the choices. Foot Control can be edited only when MIDI OUT A is selected.

Select Foot Controller assignment

−1   +1/YES

FOOT CONTROL   [DEC]   [INC]

DATA

oFF	uP	dun	nod
Off	Pitch Bend Up	Pitch Bend Down	Modulation Wheel
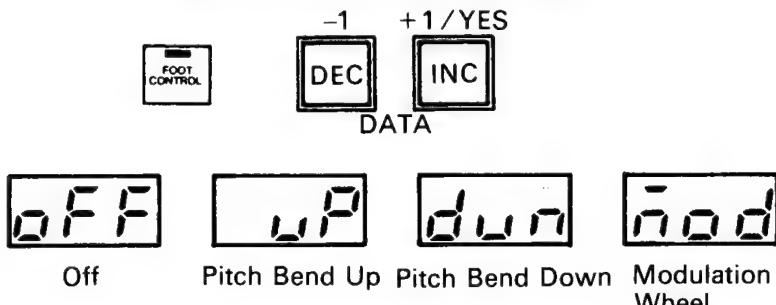
The effect this will have depends on the function settings of the tone generator (Pitch Bend Range and Step, and Modulation Wheel Assign and Sensitivity). See the owner's manual for your tone generator or synthesizer on how it accepts Pitch Bend and Modulation Wheel messages. If the tone generator's Pitch Bend Range is 12 (one octave) and Step is 1, you could play a chromatic melody on one Tom by moving the Foot Controller. If Pitch Bend Step is 0 (continuous), you could "tune" a Timpani. If modulation Wheel were assigned to Amplitude Modulation Depth, the Foot Controller could regulate the tremolo depth of a Vibes sound. By setting DX/TX Modulation Wheel assignment to EG Bias, you could control the volume or tone of a voice (depending on if the EG Bias of a carrier or modulator is being affected). Remember that Foot Control for each pad can be set to a different effect, or turned off. While one voice goes smoothly up, another could jump down in whole-steps.

SIMUL-NOTES

You can specify any combination of up to 5 notes to be sent from output A each time a pad is hit. (Ie. up to 5 MIDI Note On messages will be sent for each trigger.) Simul-Notes can be edited only when MIDI OUT A is selected. Use DATA [DEC] / [INC] to select how many notes you want. (When Simul-Notes is 2 or more, Dynamic Note Shift will not function (see p.24).

−1   +1/YES   Select number of simultaneous notes

SIMUL NOTES   [DEC]   [INC]

DATA

5

1 – 5
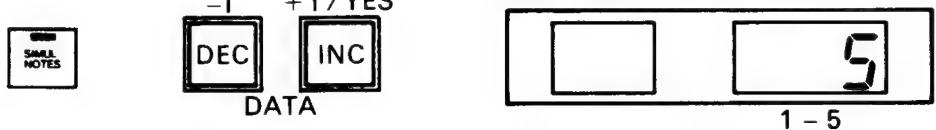
Simul-Notes Touch

By turning Simul-Notes Touch On, you can vary the number of notes sounded by hitting harder or softer. A soft hit will play the first simul-note. A hard hit will play all five.

−1   +1/YES   Simul-notes touch (on/off)

SIMUL NOTES   [DEC]   [INC]

(Press again-blinking)   DATA

oFF

– 23 –
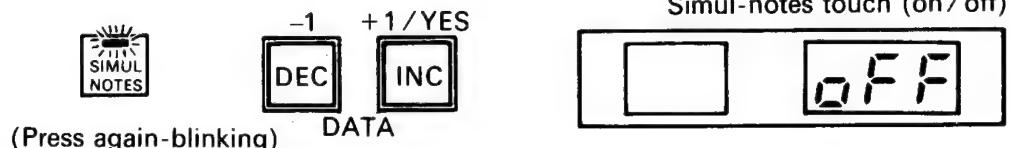
Simul-Notes with DX/TX

To set the Note Number for each note, use the NOTE key (see p.20).

With a DX/TX, you can use Simul-Notes to play a "chord" of percussion. Parallel fifths of doubled-octave drums can sound quite impressive. (Set Note Numbers to C1, G1, C2, G2.)

Simul-Notes with RX

When using a RX, you can combine several instruments to be played from one pad. For example by setting a pad to transmit Note Numbers A2, E2 and G♭2, one hit would play Bass Drum, Snare and Claps.

DYNAMIC NOTE SHIFT

You can use this to make the note sent from output A go higher (or lower) depending on how hard you hit the pad. (A Note On message for a higher or lower note will be sent.) Dynamic Note Shift can be edited only when MIDI OUT A is selected. Each time you press this switch, it will alternate between selecting Range and Step. If either Range or Step is set to 0, Dynamic Note Shift will have no effect. (When Simul-Notes is 2 or more, Dynamic Note Shift will not function (see p.23).

Range

The LED is lit. The display will alternate will "rnG". Use DATA [DEC] / [INC] to select how many steps the hardest hit will shift (0-12). Each number represents a half-step.

(Press once-lit)   DATA   −1   +1/YES   Select range   0 – 12
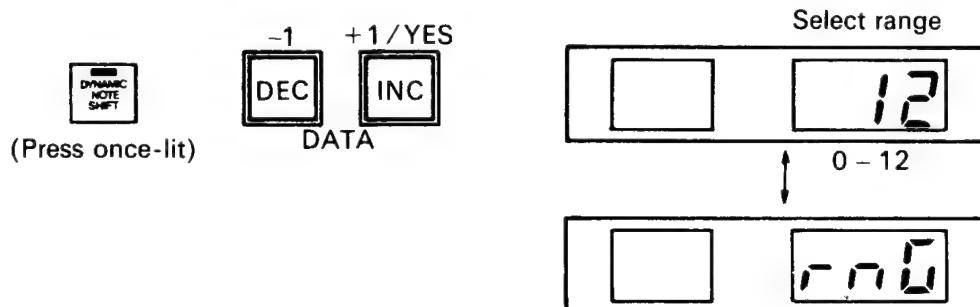
Step

The LED is blinking. The display will alternate will "stp". Use DATA [DEC] / [INC] to select -12 to 12. Each step is 100 cents. For example, to play an upward chromatic scale of one octave with successively harder hits, set Range to 12 and Step to 1.

(Press again-blinking)   DATA   −1   +1/YES   Select step   -12 – 12
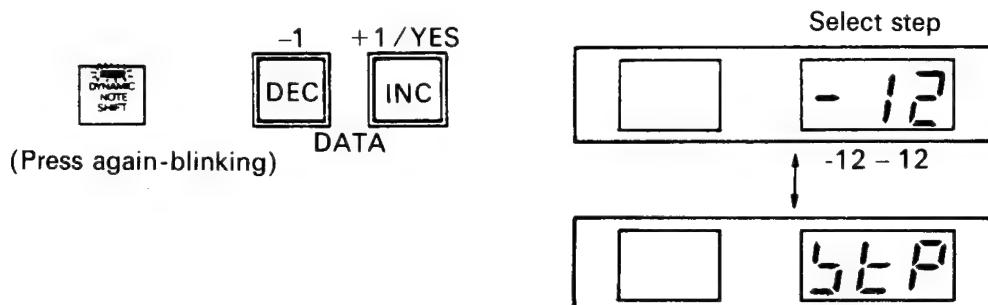
MEMORY FUNCTIONS

Here we will explain in detail all functions for saving and loading PMC1 memory data. You can send and receive memory data between two PMC1s, or to and from a RAM cartridge. If an error message appears during operation, refer to the error message table on p.38.

STORE/COPY MEMORY

The procedure for Copying a memory to another location is the same as Storing; simply Store without making any changes. To Store the current setup in a memory, press STORE and then select the new location. (If if you select another memory without pressing STORE, new data will be called into the edit buffer and the settings you have just made will be lost.) The right side of the display shows "Str", so use the INTERNAL or CARTRIDGE keys and MEMORY [DEC] / [INC] to select internal or cartridge memories 1-32. When you press YES, the current settings will be stored in the selected memory.

Select destination

Store in this memory?
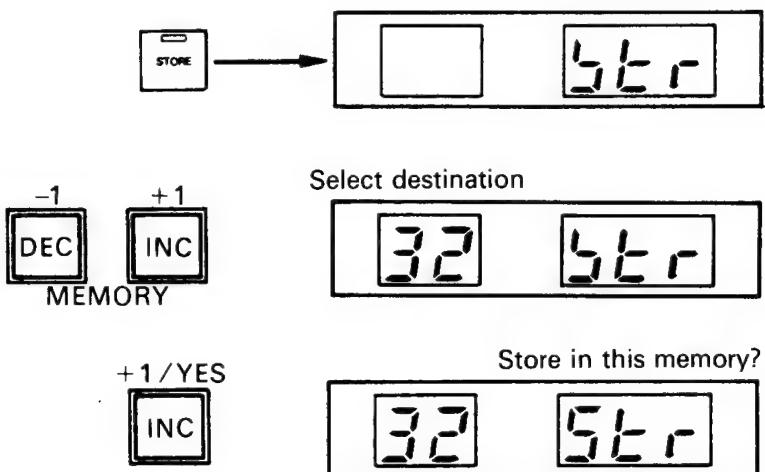
SAVE ALL MEMORY TO CARTRIDGE

You can save the 32 PMC1 memories and 8 memory chains in a RAM cartridge. (The same type that the DX7 uses). Insert a properly formatted RAM cartridge (see Format, p.28), and make sure the cartridge memory protect switch is off. Press SAVE/TRANSMIT and then CARTRIDGE. The display will show "SV crt" indicating that you are "saving to a cartridge." Press YES (the DATA [INC] key). The display will show "---", and when saving is complete will return to the "SV crt" display. Press any key to exit.

Save memory to cartridge?

Saving
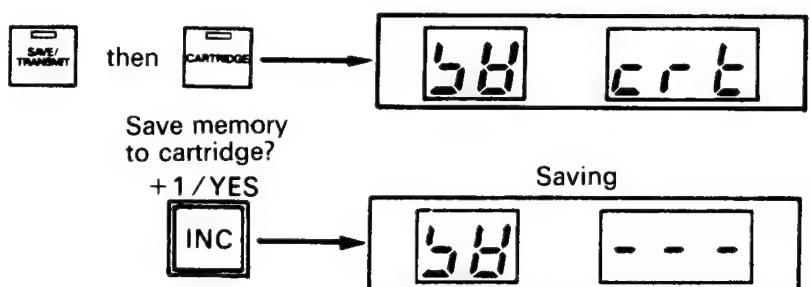
LOAD ALL MEMORY FROM ARTRIDGE

You can load the 32 PMC1 memories and 8 memory chains from a RAM cartridge into the PMC1. Insert a RAM cartridge containing PMC1 memory data. Press LOAD / RECEIVE and then CARTRIDGE. The display will show "Ld crt" indicating that you are "loading from a cartridge." Press YES. The display will show "−", and when loading is complete will return to "Ld crt". Press any key to exit.

LOAD/ RECEIVE then CARTRIDGE ➜ | Ld | crt |

Load memory from cartridge?

+1 / YES

INC ➜ | Ld | − − − |

Loading
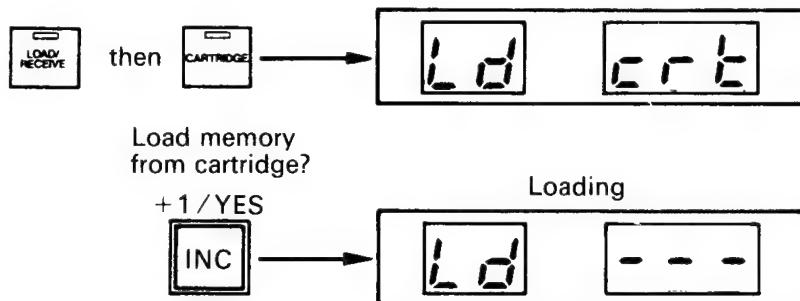
TRANSMIT ALL MEMORY TO MIDI

This lets you send the entire contents of a PMC1 to another PMC1 via MIDI. Connect the MIDI OUT (A or B) of the transmitting PMC1 to the MIDI IN of the receiving PMC1. The data is transmitted as a System Exclusive Bulk Dump. (Bulk data format is given on p.50.) For the data to be received, the receiving PMC1 must have the same System Channel as the transmitting PMC1 (see p.19). The MIDI A / B of the transmitting PMC1 will determine which output the data is sent from. Press SAVE / TRANSMIT and then INTERNAL. The display will show "tr int" indicating that you are "transmitting from internal memory." Press YES to begin transmitting. The display will show "−" and when transmission is finished will return to "tr int". Press any key to exit.

SAVE/ TRANSMIT then INTERNAL ➜ | tr | int |

Transmit from internal memory?

+1 / YES

INC ➜ | tr | − − − |
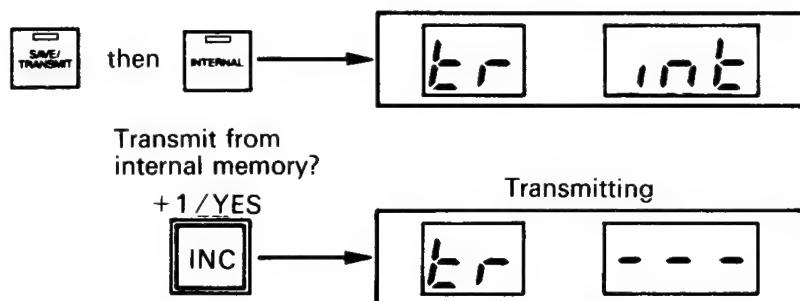
Transmitting

RECEIVE ALL MEMORY FROM MIDI

This function sends a Dump Request to another PMC1, causing it to send its internal memory via MIDI. As explained above, System Channel numbers must match, and MIDI A/B of the transmitting PMC1 will determine which output the data is sent from. Press LOAD/RECEIVE and then INTERNAL. The display will show "rE int" indicating that you are "receiving to internal memory." Press YES and a dump request will be sent from the receiving PMC1. The transmitting PMC1 responds by sending its internal memory via MIDI. When the data begins to arrive, the display will show "–". When the data has been completely received, the display will change to "End".

[LOAD/RECEIVE] then [INTERNAL] ⟶ | rE | int | Receive to internal memory?
+1/YES [INC] ⟶ PMC1 sends a dump request

⟶ Other device sends data ⟶ | rE | - - - | ⟶ | rE | End |

- 27 -
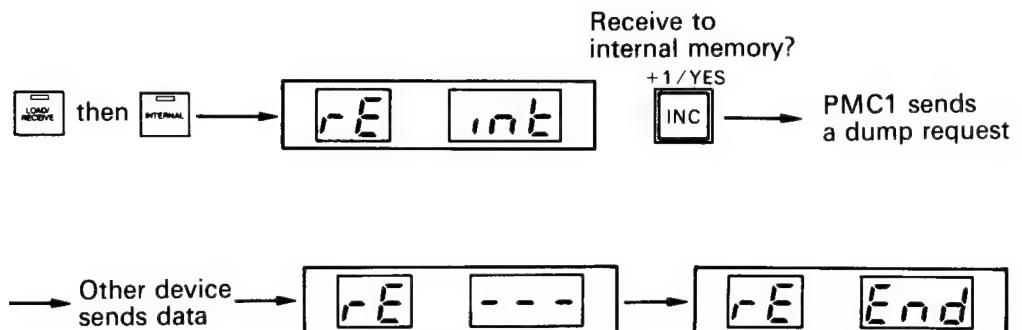
SAVE/LOAD OTHER DATA

In addition to its own memory data, the PMC1 can act as a RAM cartridge interface for MIDI devices such as the TX7 which have no cartridge interface. Before a RAM cartridge can be used to store data, it must be formatted to accommodate that type of data.

FORMAT CARTRIDGE

Press LOAD/RECEIVE and SAVE/TRANSMIT together. Both LEDs will start blinking. To format a RAM cartridge to store PMC1 data, press INTERNAL. For other types of data, use Pad Select keys 1-4 to select the format type. The display will show the format you have selected.

Type	Display	Data
INTERNAL	Fo int	PMC1 memory data
Pad 1	Fo F-1	DX1, 5, 7, 9, TX7, 816 voice data
2	Fo F-2	DX1, 5, TX7, 816 function data
3	Fo F-3	DX21, 27, 100 voice data
4	Fo F-4	Other types of Yamaha data

Press YES and formatting will begin. THIS WILL ERASE ALL DATA IN THE CARTRIDGE. While formatting, the display will show "−" and when finished will return to the format select display.

RECEIVE TO CARTRIDGE

This is where bulk data is received from MIDI IN and stored directly into a cartridge. Connect a PMC1 MIDI OUT to the MIDI IN of the other device (DX, TX, etc.). Connect the PMC1 MIDI IN to the MIDI OUT of the other device.
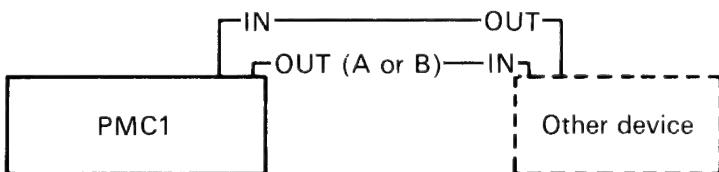
Insert a RAM cartridge formatted for the type of data you want to receive. Press LOAD/RECEIVE and then VOICE/FUNCTION. The display will show the format type of the cartridge as described above. Press YES and a Dump Request message for the appropriate format will be transmitted on the System Channel (see p.19) from MIDI OUT A or B, whichever is currently selected. The other device (DX, TX etc.) will respond by sending the requested bulk data. When the data starts coming, the display will show "−" and when the data is completely stored in the cartridge, the display will show "End".
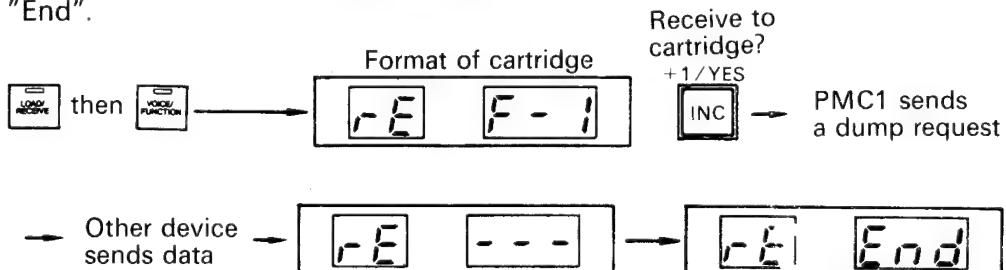
TRANSMIT FROM CARTRIDGE

This is where the contents of a RAM or ROM cartridge are sent directly out of MIDI OUT A or B (depending on which is currently selected). Insert the cartridge. Press SAVE/TRANSMIT and then VOICE/FUNCTION. The format type of the cartridge will be displayed as described on p.28. When you press YES (or a Dump Request of the appropriate format number is received), the data in the cartridge will be sent directly from MIDI OUT A or B.

Format of cartridge

[SAVE/TRANSMIT] then [VOICE/FUNCTION] ⟶ | ᵗ ʳ | F - 1 |

Transmit from cartridge?
+1/YES

[INC] ⟶ Cartridge data sent directly from MIDI out A or B

| ᵗ ʳ | - - - |
↓
| ᵗ ʳ | F - 1 |
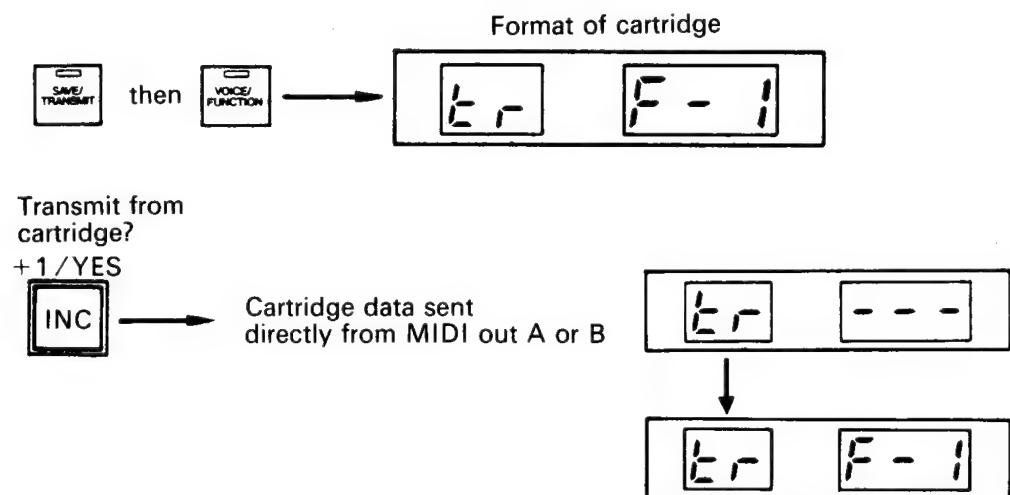
OTHER FUNCTIONS

CHAIN

This lets you tie PMC1 memories together in a chain of up to 20 "links." When the Chain LED is on, the PMC1 will switch itself to the next memory in the chain each time you press the footswitch. In the same way, pressing DATA [DEC] / [INC] will step through the chain (1-20). You can program up to 8 of these chains, each with 20 links.

Chain 8
Chain 2
Chain 1 | INT 15 | INT 1 | INT 32 | | INT 9 |
1   2   3
20 links per chain
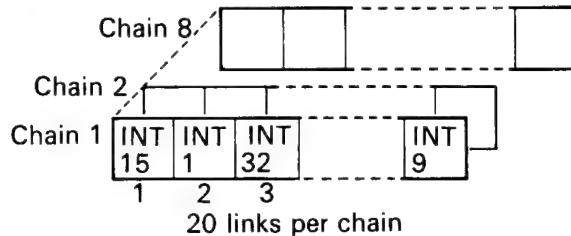
Select the chain (1-8) you want by pressing a pad select switch (1-8). The pad LED indicates which chain is selected. This is especially useful in a live performance where you could have a different chain for each song in the set.

Which chain?
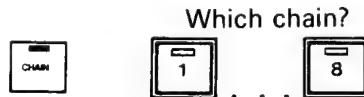
To change the PMC1 memory in a link, select the link using DATA [DEC] / [INC].

Select link
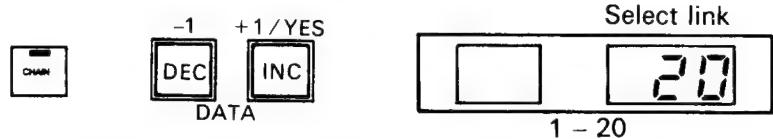
Then use MEMORY [DEC] / [INC] to select the memory you want.

Select memory
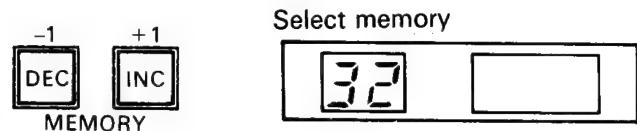
Notice that a decimal point appears in the Memory Number display, indicating that the memory number has been changed. To save the changed memory number, press STORE, and the decimal point will go off. You need to press STORE each time you change a link of the Chain.
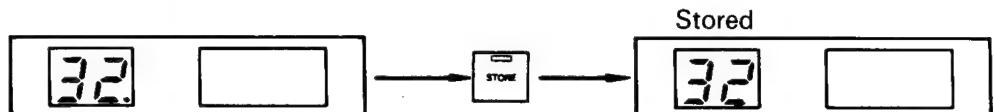
Stored

If you want to program a Chain of less than 20 links, you can set the end of the chain by pressing STORE twice. The left place of the right display will show "E", indicating the end of the chain.

15 links in this chain

Set end
Press twice

End of chain
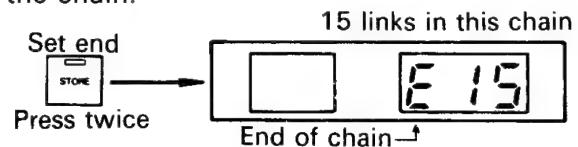
INITIALIZE PMC1

By turning the power on while pressing MEMORY DEC and Pad Select 4, you can set all 32 internal memories as follows. All parameters except Gate Time will be set to the lowest value or "off". Gate Time will be set to 100. Note will be set to C3. The System Channel will be I6.

MERGE

You can select whether MIDI messages received at MIDI IN will be sent out unchanged (merged) from MIDI OUT A or B. Select MIDI OUT B Press FOOT CONTROL. The display will alternate between "MrG" and "A", "OFF" or "b". Use the data DEC / INC to select the merge output.

EDIT RECALL

If you have been editing, and accidently lose your work by selecting another memory, press the two memory select switches together. The display will show "CAL" for a few seconds, and the data you were previously editing will be restored.

ADVANCED SETUPS

Here are some more complicated setups. We will assume that you have read through the manual to this point, tried out the simple setup examples, and understand the basic operation of the PMC1. If you have problems setting up the examples, refer back to PAD PARAMETERS (p.17). For these example, connect a PBD1 to pad input 1, and PTT1s to pad inputs 2-8. When setting up an entire memory from a setup chart, you will find it is fastest to select a parameter, set it for all 8 pads, and then move on to the next parameter.

ADVANCED SETUPS (PMC1 + DX7 + RX11)

Setup 1: Drum Kit

Memory Number:
System Program Change:

PMC1 SETUP MEMORY CHART

PARAMETER	PAD1	PAD2	PAD3	PAD4	PAD5	PAD6	PAD7	PAD8
CHANNEL	1	1	1	1	1	2	1	1
NOTE	A1	E2	F2	D2	C2	C3	A3	D3
PROGRAM CHANGE						XX		
FOOT CONTROL						Up		
SIMUL-NOTES	1	1	1	1	1	1	1	1
TOUCH	Off	Off	Off	Off	Off	Off	Off	Off
DYNAMIC NOTE SHIFT RANGE	0	1	0	0	0	0	1	1
DYNAMIC NOTE SHIFT STEP		1					1	1
GATE TIME								
SUSTAIN								
CHANNEL								
NOTE								
PROGRAM CHANGE								

OUT A ────── IN ┐ ┌ THRU ────── IN ┐

PMC1   DX7   RX11

DATA RANGE
1 - 16
C-2 – G8 Up to 5 notes
0 - 128 0: Nothing will be sent
Off, Up, Down, Modulation
1 - 5
OFF / ON
0 - 12
-12 - 0 - 12
1 - 255
OFF / ON
1 - 16
C-2 – G8 One note
0 - 128 0: Nothing will be sent

This is a "traditional" drum kit, with a few extras. A DX7 and a RX11/15 are used as the sound sources. (A RX21 is possible, but does not include all the instruments used in this example, and its instrument note numbers cannot be changed). We will use the Dynamic Note Shift feature with the RX and use the Foot Control with the DX, so both must receive signals from PMC1 OUT A. Connect MIDI cables as shown in the diagram.

Set the RX to CH INFO AVAIL and RECEIVE CH = 01. Set the DX7 to receive channel 2, and set DX7 Pitch Bend Range to 5 and Pitch Bend Step to 1.

The RX instrument note numbers must be set to the initial settings except for the following. We need to reset these to take advantage of the Dynamic Note Shift. When you hit a pad especially hard, the transmitted note will go up one step, and the second instrument will sound.

RIMSHOT (E♭2 → F2)
HH OPEN (B2 → B♭2)
CRASH (C3 → E♭3)

The pads will play the following instruments. (Normal / Hard hit)

Pad 1 BD
     2 SD / RIMSHOT
     3 TOM1
     4 TOM2
     5 TOM3
     6 DX Timpani (with foot control Pitch Bend Up)
     7 HH CLOSED / OPEN
     8 RIDE / CRASH

Note:

Set the Pad 6 Program Change Number (xx) to match the location of the Timpani voice in your DX7.

Setup 2: TX816

Memory Number:
System Program Change:

PMC1 SETUP MEMORY CHART

	PARAMETER	PAD1	PAD2	PAD3	PAD4	PAD5	PAD6	PAD7	PAD8	
A	CHANNEL					5	6		8	1
	NOTE									C
	PROGRAM CHANGE					XX	XX		yy	C
	FOOT CONTROL					Up	Down		Modulati	N
	SIMUL-NOTES					1	1		1	1
	TOUCH									C
	DYNAMIC NOTE SHIFT RANGE					0	0		0	
	DYNAMIC NOTE SHIFT STEP									
AB	GATE TIME									
	SUSTAIN									C
B	CHANNEL	1	1	1	1			1		
	NOTE	A1	E2	F2	D2			A3		
	PROGRAM CHANGE									C

OUT B   OUT A   **IN**   **IN**

PMC1   TX816   RX11

DATA RANGE
1 – 16
C-2 – G8 Up to 5 notes
0 – 128 0: Nothing will be sent
Off, Up, Down, Modulation
1 – 5
OFF / ON
0 – 12
-12 – 0 – 12
1 – 255
OFF / ON
1 – 16
C-2 – G8 One note
0 – 128 0: Nothing will be sent
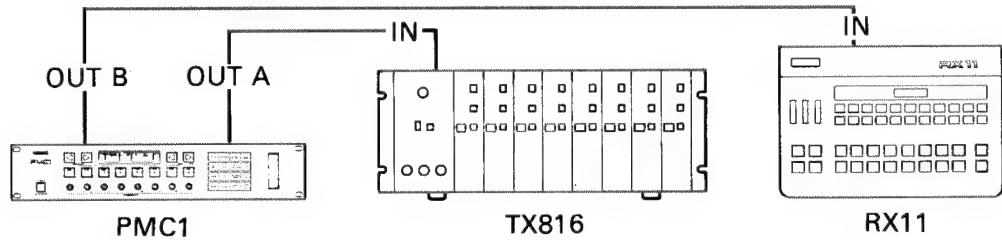
This example uses a TX816 to add synthesizer sounds to the digitally recorded percussion sounds of the RX. It shows how you can use the foot control to do several things at once. Not only can the foot controller be set to send different messages from each pad's channel, but each TX module can interpret Foot Controller messages in different ways.

The "normal" drum kit is transmitted to the RX from MIDI OUT B, as described in the previous example.

Signals to the TX816 will be transmitted from MIDI OUT A. In this example we will give settings for three pads, and you can set the rest depending on the voices you have in your TX. Set the TX modules 1-8 to receive channels 1-8, and use a DX to set modules 5, 6 and 8 to the function settings described below. (If you don't have a DX7, you can use a CX music computer with the DX7 voicing program (YRM-103) to set the TX function settings.)

TX Module	Voice	TX Function Setting
5	Timpani	Pitch Bend Range 7, Step 0
6	Timpani	Pitch Bend Range 7, Step 0
8	Tubular Bells	Foot Controller Sensitivity 80, Foot Controller Assign → PMD

With these settings, play a drum roll on pads 5 and 6 while moving the foot control. Pad 5 Timpani will pitch bend up and pad 6 Timpani will pitch bend down. The foot control will control the amount of vibrato for pad 8 Tubular Bells.

The PMC1 and TX816 are a very powerful combination. You can set each pad (each TX module) to react to the foot controller in a different way. The PMC1 Foot Control parameter decides which MIDI messages the foot control will send, and the TX function parameters decide how the TX will react to that message. For example by setting the TX to interpret MIDI Foot Control messages as EG Bias, you could use the foot control to regulate the volume of TX voices who's FM carriers have AMS. (Amplitude Modulation Sensitivity allows the output of each operator to change. See your DX7 manual.) If the FM modulators of the TX voice have AMS, the PMC1 foot control would change the tone of the TX voice. The possibilities are endless.

IDEAS AND SUGGESTIONS

Additional uses

● Using Simul-Notes, three or four pads could be set to play a TX pitched voice (brass, piano, etc.) and produce the main chords in a song. This could provide the harmonic backing for an entire song. (Using the sustain footswitch will help.)

● If 8 pads are not enough, you can easily add another PMC1. So that the second PMC1 will follow memory changes (or chains), set the System Program Change of the first PMC1 to match its memory number. Each time you select a memory on the first PMC1, it will transmit a Program Change corresponding to its own memory number, automatically switching the second PMC1. There is no need to set up a Chain for the second PMC1.

● A RX21L is an inexpensive way to add 15 Latin Percussion sounds to your setup.

● A FB-01 FM Sound Generator is an inexpensive way to add 8 synthesizer sounds to your setup. (The FB-01 internal ROM preset voices include many percussive sounds.)

● Note Limit with TX816 can be used to play different TX voices according to how hard you hit the pad. Set the Note Limit on several TX modules to each produce only one note and use Dynamic Note Shift to play the different TX sounds from one pad. For example, one module would sound only for C3, another only for Db3, and so on.

● Simul-Notes with RX. Connect the RX to OUT A and use Simul-Notes to play several RX voices with one hit, for example by layering Claps on the Snare.

Using other MIDI devices with the PMC1

Any MIDI device can be used with the PMC1 to extend its possibilities. The MIDI Control Station MCS2 has 9 assignable controllers which can be set to produce any type of MIDI controller message. The MIDI Event Processor MEP4 can change, filter and delay MIDI messages. Here is an advanced example using these two.

● Pedal Hi-Hat. Connect a FC4 footswitch to the MCS2 and assign it so send Sustain On/Off messages. (Or you could use the sustain pedal of a DX7.) Connect the MCS2 MIDI OUT to the PMC1 MIDI IN, the PMC1 MIDI OUT to the MEP4 MIDI IN, and the MEP4 MIDI OUT to the RX MIDI IN. Set MERGE to the appropriate MIDI out (see p. 31).

FC4   MCS2   PMC1   MEP4   RX11
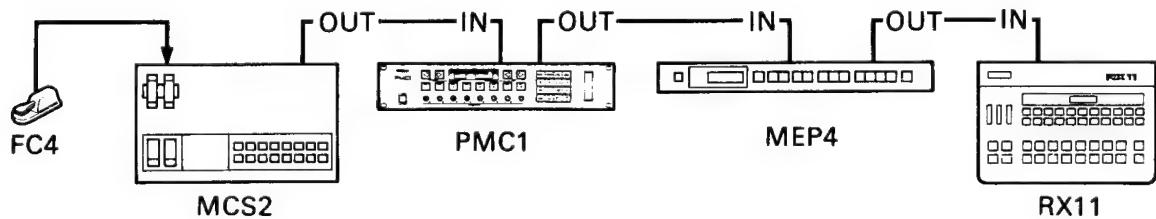
Set the MEP4 to convert the Sustain On/Off messages produced by the MCS2 footswitch into Note On/Off messages for the RX Closed Hi-Hat. Assign a PMC1 pad to play Open Hi-Hat. Pressing the MCS2 footswitch will play Closed Hi-Hat. The RX will not play Open and Closed Hi-Hats at the same time. This means that you can hit the pad to play Open Hi-Hat, then press the footswitch to close it.

● In setting up systems like this, it is easy to lose track of what is going on. It is important to ask yourself "What do I want?" and then "How can I do it?" If you begin by considering "What can I do?" you will just be overwhelmed by an infinity of staggering possibilities.

● Add live percussion parts to programmed rhythm. Since the PMC1 MIDI IN can be transmitted unchanged (see Merge p.31) from MIDI OUT, a Tempo Clock producing device (QX sequencer, MCS2 control station) could be connected to PMC1 MIDI IN. The Tempo Clock signals would be echoed back from MIDI OUT and control the rhythm playback of RXs connected to PMC1 MIDI OUT. You could play fills using the pads.

Clock-producing MIDI device (QX, MCS2 etc.)   PMC1   RX11
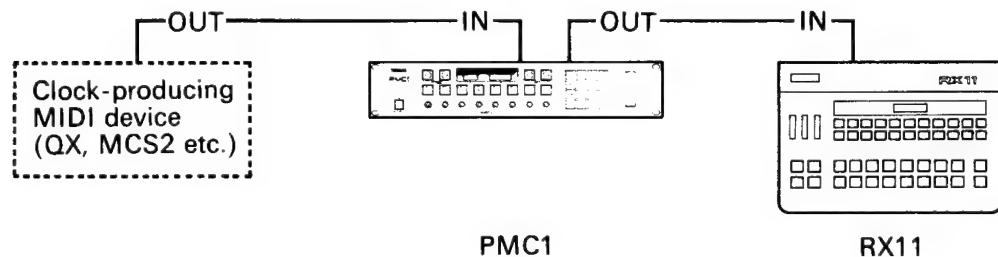
ERROR MESSAGES
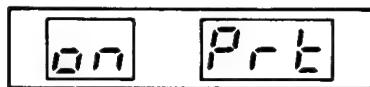
`no` `rdY`	There is no cartridge.
`on` `Prt`	Store failed because the RAM cartridge protect switch was on.
`Ld` `Err`	Faulty data was loaded from internal or cartridge memory. The faulty data has already been loaded into internal memory.
`St` `Err`	Store to cartridge was unsuccessful. Faulty data may have been stored into the cartridge.
`id` `Err`	The RAM cartridge has not been formatted.
`rE` `Our`	Data received in "Other" format (p.28) was larger than 4 K bytes, and would not fit in the RAM cartridge.
`nd` `Err`	The check sum of a bulk dump was incorrect.
`no` `dAt`	The RAM cartridge is formatted in "Other" format, but contains no data.
`**` `FuL`	The MIDI buffer is full. (Memory numbers (*) display is unchanged.)
`no` `bAt`	The PMC1 memory backup battery is low. Contact your Yamaha dealer for replacement.
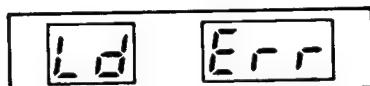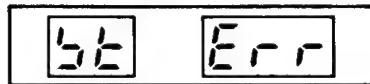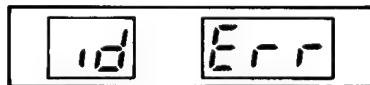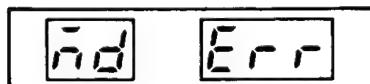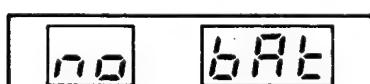
SPECIFICATIONS

Memories . . . . 32 internal, 32 cartridge

Switches . . . . MEMORY INC
MEMORY DEC
PAD SELECT 1-8
DATA INC
DATA DEC
INTERNAL
CARTRIDGE
LOAD / RECEIVE
SAVE / TRANSMIT
MIDI A / B
CHAIN
VOICE / FUNCTION
STORE
CHANNEL
NOTE
PROGRAM CHANGE
GATE TIME
SUSTAIN
FOOT CONTROL
SIMUL-NOTES
DYNAMIC NOTE SHIFT

Controls . . . . Pad Sensitivity 1-8

Display . . . . 5 character LED

Terminals . . . . MIDI IN
MIDI OUT A, B
MEMORY SELECT
SUSTAIN PEDAL
FOOT CONTROL
PAD IN 1-8

Power consumption 10W

Dimensions . . . . 480 (W) x 296 (D) x 90 (H) mm
(18-15 / 16" x 11-1 / 2" x 3-1 / 2")

Weight . . . . 4.2 kg (9 lbs 5 oz)

Included items . . . . DX Voice data ROM cartridge

ADDITIONAL INFORMATION

RX11, 15, 21, 21L INSTRUMENT NOTE NUMBER TABLE

RX11/15

The RX11 has 16 instruments and the RX15 has 13 instruments. Instrument note settings can be changed by the user. Here are the initial settings. (You can initialize your RX to this condition by pressing FORMAT while holding FUNCTION in the pattern or song modes. See your owner's manual.)

Instrument	Note Name
SD1	E2
SD2*	Db2
TOM1	F2
TOM2	D2
TOM3	C2
TOM4*	B1
BD1	A1
BD2*	Ab1
HH OPEN	B2
HH CLOSED	A2
RIDE	D3
CRASH	G2
COWBELL	G2
RIM	Eb2
SHAKER	Ab2
CLAPS	Gb2

* The RX15 does not have SD2, TOM4 or BD2.

RX21/21L

The RX21 has 9 instrument, and the RX21L has 16 instruments. Instrument Note settings can not be changed, and are preset as follows.

RX21		RX21L	
Instrument	Note Name	Instrument	Note Name
BD	A2	CONGA H MUTE	Gb3
TOM3	C2	CONGA H OPEN	F3
TOM2	D2	CONGA L	E3
SD	E2	TAMBOURINE	B4
TOM1	F2	BONGO H	Ab3
CLAP	Gb2	BONGO L	G3
HH CLOSED	A3	TIMBALE H	Bb4
HH OPEN	B3	TIMBALE L	A4
CYM	C3	AGOGO H	Eb4
		AGOGO L	D4
		COWBELL	C4
		CUICA H	F4
		CUICA L	E4
		WHISTLE 1	Gb4
		WHISTLE 2	G4
		CLAVES	Db4

WHAT'S HEXADECIMAL?

Computers are made up of a huge number of electronic circuits, and an electronic circuit can be in one of two conditions; on or off. This means that computers deal with numbers in different form than humans nornally deal with them.

The Decimal System

The way of counting that we use everyday is called the decimal system, because it has ten numerals, 0 through 9, and is based on the number ten. When we count past 9, we move one place to the left and start over from 1 again, but this "1" means something different than the first "1". You can think of this second numeral as "how many tens", and the third number as "how many hundreds." In other words, each place from right to left represents the number of 10^0 (ones), 10^1 (tens), 10^2 (hundreds), 10^3 (thousands) and so on.

The Binary System

As we mentioned, computers can recognize only two conditions (numerals); on or off (1 or 0). This means that numbers coming into a computer must be made up of ones and zeros. However, if we put enough ones and zeros together, we can express any number we want.
This way of counting is called the binary system.

	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	
BINARY	1	0	1	0	1	1	0	1	
DECIMAL	128 + 0 + 32 + 0 + 8 + 4 + 0 + 1								=173

To find what the binary number 10101101 means in decimal, add up the values of each place.

The Hexadecimal System

Binary numbers are easy for a computer to understand, but troublesome for humans to deal with. So we use an easy "middle way" called Hexadecimal (often abbreviated "Hex"). This is a number system based on the number sixteen, with sixteen numerals. Since we only have numerals 0 to 9, we will use letters of the alphabet, like this.

0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F (Hex "F" = Decimal "15")

Then, when we want to go beyond F, we move one place to the left and start with 0 again.

8,9,A,B,C,D,E,F,10,11, . . . 19, 1A,1B,1C,1D,1E,1F,20,21. . . .

(So as not to confuse hexadecimal and decimal numbers, a dollar sign "$" is often added in front of hex numbers. Eg. $AD)
Here is an example of how to convert a hex number into decimal.

	16^1	16^0	
HEX	A	D	
DECIMAL	16 x 10	1 x 13	= 173

The method is the same as when we converted a binary number into decimal.

There is a special reason for using hex when dealing with computers. Computers deal with binary information in groups of 8 bits. (Each 0 or 1 is called a "bit", for Binary digit.) Each group of 8 bits is called a byte. (8 bits = 1 byte) Notice that the left four bits of the binary number in the illustration make the same number as the left digit of the hex number, and the right four bits of the binary number make the same number as the right digit of the hex number.

	2^3 2^2 2^1 2^0	2^3 2^2 2^1 2^0	
BINARY	1 0 1 0	1 1 0 1	
HEX	$A	$D	= $ AD

MIDI sends and receives information using binary computer signals. It is quite easy to convert binary numbers to hex, and hex is easy for us to deal with (only two digits), so in this manual when we refer to MIDI data, we will use hexadecimal numbers.

BINARY DECIMAL AND HEXADECIMAL CONVERSION

Binär	Dezimal	Hex	Binär	Dezimal	Hex	Binär	Dezimal	Hex	Binär	Dezimal	Hex
00000000	0	0	01000000	64	40	10000000	128	80	11000000	192	C0
00000001	1	1	01000001	65	41	10000001	129	81	11000001	193	C1
00000010	2	2	01000010	66	42	10000010	130	82	11000010	194	C2
00000011	3	3	01000011	67	43	10000011	131	83	11000011	195	C3
00000100	4	4	01000100	68	44	10000100	132	84	11000100	196	C4
00000101	5	5	01000101	69	45	10000101	133	85	11000101	197	C5
00000110	6	6	01000110	70	46	10000110	134	86	11000110	198	C6
00000111	7	7	01000111	71	47	10000111	135	87	11000111	199	C7
00001000	8	8	01001000	72	48	10001000	136	88	11001000	200	C8
00001001	9	9	01001001	73	49	10001001	137	89	11001001	201	C9
00001010	10	A	01001010	74	4A	10001010	138	8A	11001010	202	CA
00001011	11	B	01001011	75	4B	10001011	139	8B	11001011	203	CB
00001100	12	C	01001100	76	4C	10001100	140	8C	11001100	204	CC
00001101	13	D	01001101	77	4D	10001101	141	8D	11001101	205	CD
00001110	14	E	01001110	78	4E	10001110	142	8E	11001110	206	CE
00001111	15	F	01001111	79	4F	10001111	143	8F	11001111	207	CF
00010000	16	10	01010000	80	50	10010000	144	90	11010000	208	D0
00010001	17	11	01010001	81	51	10010001	145	91	11010001	209	D1
00010010	18	12	01010010	82	52	10010010	146	92	11010010	210	D2
00010011	19	13	01010011	83	53	10010011	147	93	11010011	211	D3
00010100	20	14	01010100	84	54	10010100	148	94	11010100	212	D4
00010101	21	15	01010101	85	55	10010101	149	95	11010101	213	D5
00010110	22	16	01010110	86	56	10010110	150	96	11010110	214	D6
00010111	23	17	01010111	87	57	10010111	151	97	11010111	215	D7
00011000	24	18	01011000	88	58	10011000	152	98	11011000	216	D8
00011001	25	19	01011001	89	59	10011001	153	99	11011001	217	D9
00011010	26	1A	01011010	90	5A	10011010	154	9A	11011010	218	DA
00011011	27	1B	01011011	91	5B	10011011	155	9B	11011011	219	DB
00011100	28	1C	01011100	92	5C	10011100	156	9C	11011100	220	DC
00011101	29	1D	01011101	93	5D	10011101	157	9D	11011101	221	DD
00011110	30	1E	01011110	94	5E	10011110	158	9E	11011110	222	DE
00011111	31	1F	01011111	95	5F	10011111	159	9F	11011111	223	DF
00100000	32	20	01100000	96	60	10100000	160	A0	11100000	224	E0
00100001	33	21	01100001	97	61	10100001	161	A1	11100001	225	E1
00100010	34	22	01100010	98	62	10100010	162	A2	11100010	226	E2
00100011	35	23	01100011	99	63	10100011	163	A3	11100011	227	E3
00100100	36	24	01100100	100	64	10100100	164	A4	11100100	228	E4
00100101	37	25	01100101	101	65	10100101	165	A5	11100101	229	E5
00100110	38	26	01100110	102	66	10100110	166	A6	11100110	230	E6
00100111	39	27	01100111	103	67	10100111	167	A7	11100111	231	E7
00101000	40	28	01101000	104	68	10101000	168	A8	11101000	232	E8
00101001	41	29	01101001	105	69	10101001	169	A9	11101001	233	E9
00101010	42	2A	01101010	106	6A	10101010	170	AA	11101010	234	EA
00101011	43	2B	01101011	107	6B	10101011	171	AB	11101011	235	EB
00101100	44	2C	01101100	108	6C	10101100	172	AC	11101100	236	EC
00101101	45	2D	01101101	109	6D	10101101	173	AD	11101101	237	ED
00101110	46	2E	01101110	110	6E	10101110	174	AE	11101110	238	EE
00101111	47	2F	01101111	111	6F	10101111	175	AF	11101111	239	EF
00110000	48	30	01110000	112	70	10110000	176	B0	11110000	240	F0
00110001	49	31	01110001	113	71	10110001	177	B1	11110001	241	F1
00110010	50	32	01110010	114	72	10110010	178	B2	11110010	242	F2
00110011	51	33	01110011	115	73	10110011	179	B3	11110011	243	F3
00110100	52	34	01110100	116	74	10110100	180	B4	11110100	244	F4
00110101	53	35	01110101	117	75	10110101	181	B5	11110101	245	F5
00110110	54	36	01110110	118	76	10110110	182	B6	11110110	246	F6
00110111	55	37	01110111	119	77	10110111	183	B7	11110111	247	F7
00111000	56	38	01111000	120	78	10111000	184	B8	11111000	248	F8
00111001	57	39	01111001	121	79	10111001	185	B9	11111001	249	F9
00111010	58	3A	01111010	122	7A	10111010	186	BA	11111010	250	FA
00111011	59	3B	01111011	123	7B	10111011	187	BB	11111011	251	FB
00111100	60	3C	01111100	124	7C	10111100	188	BC	11111100	252	FC
00111101	61	3D	01111101	125	7D	10111101	189	BD	11111101	253	FD
00111110	62	3E	01111110	126	7E	10111110	190	BE	11111110	254	FE
00111111	63	3F	01111111	127	7F	10111111	191	BF	11111111	255	FF

WHAT'S MIDI?

Musical Instrument Digital Interface (MIDI) is a way for keyboards, synthesizers, sequencers, rhythm machines, and computers to communicate with each other. Devices that have a MIDI jack can be connected together to send and receive information. Since most musical instrument manufacturers have agreed on MIDI, you can connect devices of various manufacturers.

Each piece of information is called a MIDI MESSAGE. Each MIDI message is made up of 1 to 3 bytes (numbers); a Status Byte and 0,1 or 2 Data Bytes.

The typical MIDI message is in the following form.

Sn. xx. yy

S =   Status (8-E)
n =   Channel number (0-F indicates channel 1-16)
xx =   First data byte (00-7F)
yy =   Second data byte (00-7F)

Let's look at a sample 3-byte MIDI message.

$$\text{93. 3C. 15}$$

Status (Note On)   Channel #4   Note #   Velocity
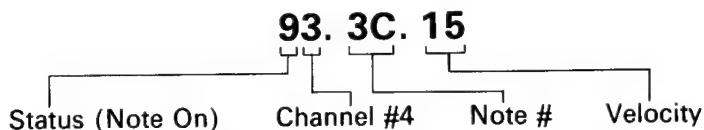
For example, if a DX7 synthesizer receives this message, it does the following.

1. Checks the channel number to see if it is acceptable. If the DX7 has been set to receive that channel, it goes on to the next step. If not, the message is ignored. In the example above, the channel number is 4. (We count 0-F as 1 to 16.)

2. Checks the status. In this case, the status is Note On, so the DX7 knows to expect two more data bytes; note number (what note) and velocity (how hard it was hit).

3. Reads the data bytes and produces the correct note with the correct velocity.
   (Keep in mind that all this takes only a very short time. It takes about 1 /1000 second to send a MIDI message. To us, it seems that the sound was produced at the same time we pressed the key.)

Some MIDI messages have only two bytes, a status byte and a data byte. For example,

C3. 05

is a Program Change message on channel 4, telling the receiving device to switch to program number 6.

MIDI messages with a status byte from F0 to FF have no channel number. They are called System messages, and are received by all devices regardless of their channel setting.

For an explanation of each type of message, see the MIDI Format Table on **p.47**.

MIDI FORMAT TABLE

	Message	Status Byte	First Data Byte (xx)	Second Data Byte (yy)
CHANNEL MESSAGE	Note Off	8n	Note Number	Velocity
	Note On	9n	"	"
	Polyphonic Aftertouch	An	"	Pressure
	Control Change	Bn	(Control Number) 01 Modulation Wheel 02 Breath Controller 04 Foot Controller 05 Portamento Time 06 Data Entry Slider 07 Main Volume 40 Sustain 41 Portamento 42 Sostenuto 43 Soft 60 Data Increment 61 Data Decrement 7A Local 7B All Note Off 7C Omni Off 7D Omni On 7E Mono On 7F Poly On	Data " " " " " 00: Off 7F: On 7F 7F 00: Off, 7F:On 00 00 00 00–0A(Number of channels) 00
	Program Change	Cn	Program number	
	Channel Aftertouch	Dn	Pressure	
	Pitch Wheel	En	LSB	MSB
SYSTEM MESSAGE — COMMON MESSAGE	System Exclusive	F0	Mfgr. ID code	(???)
		F1		
	Song Position Pointer	F2	LSB	MSB
	Song Select	F3	Song number	
		F4, F5		
	Tune Request	F6		
	End Of Exclusive	F7		
SYSTEM MESSAGE — REALTIME MESSAGE	Timing Clock	F8		
		F9		
	Start	FA		
	Continue	FB		
	Stop	FC		
		FD		
	Active Sensing	FE		
	System Reset	FF		

8n Note Off:	The note number indicates which key was released, and velocity indicates how quickly it was released. Very few keyboards have Release Velocity Sensitivity. (The Sequential Circuits Prophet T8 is one.) Most other keyboards (such as the Yamaha DX series) send a Note On message with a velocity of 0 to indicate a Note Off.
9n Note On:	The note number indicates which key was pressed, and velocity indicates how hard it was hit. On keyboards which do not have a velocity sensitive keyboard (such as the DX21), a medium value of 40 is sent. A Note On message with a velocity of 0 is the same as a Note Off message.
An Polyphonic Aftertouch:	The note number indicates which key is being pressed, and pressure indicates how hard that key is being pressed. (Ie. each key can send independent aftertouch messages.)
Bn Control Change:	The control number indicates which controller is being moved, and the data indicates the position of the controller. In this chart, control changes 01 – 07 are "continuous controllers." (Slider or wheel-type controllers.) They carry data in the range of 00–7F. Control changes 40–43 are on/off switch-type controllers, and carry data of either 0 or 7F. Control changes 7A–7F are a special type of control change called Mode Messages, and usually carry a fixed data byte. They tell the receiving tone generator how to behave. The way in which these message are interpreted will depend on the device. (See the MIDI Implementation Chart for your tone generator or synthesizer.)
Cn Program Change:	This tells the receiving device to switch programs (memories).
Dn Channel Aftertouch:	Also called "Common Aftertouch", this is found on the DX7.
En Pitch Wheel:	To provide finer resolution, this data is sent in two bytes, first the Least Significant Byte (LSB) and then the Most Significant Byte (MSB). Yamaha tone generators and synthesizers ignore the LSB.
F0 System Exclusive:	After F0 must come an identification number which has been assigned to each manufacturer. Yamaha's number is 43. What comes between this message and F7 (End of Exclusive) is completely up to each manufacturer (but each byte must be between 0 and 7F). Yamaha uses System Exclusive messages to transmit voice data, sequence data, rhythm pattern data, bulk memory data of all kinds, and many other useful things. See the System Exclusive format chart for your device.
F7 End Of Exclusive: (EOX)	This marks the end of a System Exclusive message.

F2, F3, F8, FA, FB, FC, FF	Song Position Pointer, Song Select, Timing Clock, Start, Stop, Continue, System Reset are all for controlling sequencers and rhythm machines. See the MIDI Implementation Chart for your device.
FE Active Sensing:	If there are no MIDI messages that have to be sent, one of these is sent every 300 msec just to let the receiving devices know that there is still someone out there. If there have not been any MIDI messages for a long time (like 1 / 2 a second), the receiving device assumes that some error has taken place (eg. a MIDI cable was pulled out by mistake) and will stop all notes.
F1, F4, F5, F9, FD	These are unused, and reserved for future expansion.

SYSTEM EXCLUSIVE DATA FORMAT

RECEPTION DATA

The PMC1 will receive two types of System Exclusive message.

1. 32 Memory and 8 Chain Bulk Data

Status	F0
ID	43
Sub-status / Device no.	0n (n = device number 0-F)
Format no.	7E
Byte count	20,00 (MSB < LSB)
Header	4C, 4D, 20, 20, 38, 34,39,37,20,20
	('L'M'–'–'8'4'9'7'–'–)
Data	(4086 bytes)
Check sum	?? (one byte)

There must be an interval of at least 100 ms at this point.

Byte count	1F, 4A (MSB, LSB)
Data	(4042 bytes)
Check sum	?? (one byte)
EOX	F7

Data is divided into MSB and LSB and sent as ASCII code. The check sum's MSB is masked.

2. Dump request

Status	F0
ID	43
Sub-status / Device no.	2n (n = device number 0-F)
Format no.	7E
EOX	F7

TRANSMISSION DATA

When the PMC1 receives a dump request as above with the appropriate device number, it will transmit 32 Memory Bulk data in the format described above.

PMC1 SETUP MEMORY CHART

Memory Number:
System Program Change:

PARAMETER		PAD1	PAD2	PAD3	PAD4	PAD5	PAD6	PAD7	PAD8	DATA RANGE
A	CHANNEL									1 – 16
	NOTE									C-2 – G8 Up to 5 notes
	PROGRAM CHANGE									0 – 128 0: Nothing will be sent
	FOOT CONTROL									Off, Up, Down, Modulation
	SIMUL-NOTES									1 – 5
	TOUCH									OFF / ON
	DYNAMIC NOTE SHIFT RANGE									0 – 12
	DYNAMIC NOTE SHIFT STEP									-12 – 0 – 12
AB	GATE TIME									1 – 255
	SUSTAIN									OFF / ON
B	CHANNEL									1 – 16
	NOTE									C-2 – G8 One note
	PROGRAM CHANGE									0 – 128 O: Nothing will be sent

[Percussion MIDI Converter]   Date : 3/26, 1986
        Model PMC1   MIDI Implementation Chart Version : 1.0

	Transmitted A B	Recognized	Remarks
MIDI OUT ...			
:Basic Default	1 - 16	1 - 16	memorized
:Channel Changed	1 - 16	1 - 16	
:Mode Default	3	x	
Messages	x	x	
Altered	XXXXXXXXXXXXX	x	
:Note	0 - 127	x	
:Number : True voice	XXXXXXXXXXXXX	x	
:Velocity Note ON	o 9nH,v=1-127	x	
Note OFF	x 9nH,v=0	x	
:After Key's	x x	x	
:Touch Ch's	x x	x	
:Pitch Bender	o x	x	:7 bit resolution
1	o x	x	modulation by foot pedal
:Control			
:Change			
:Prog	o 0 - 127	o 0 - 127	
:Change : True #	XXXXXXXXXXXXX	0 - 63	:32-63:cartridge
:System Exclusive	o o	o	X1
:System : Song Pos	x x	x	
: Song Sel	x x	x	
:Common : Tune	x x	x	
:System :Clock	x x	x	
:Real·Time :Commands	x x	x	
:Aux :Local ON/OFF	x x	x	
:All Notes OFF	x x	x	
:Mes- :Active Sense	o o	x	
:sages:Reset	x x	x	
:Notes	X1 PMC1 setup data, DX voice data, and other bulk data. X2 Received messages can be bypassed to MIDI OUT A or MIDI OUT·B.		

Mode 1 : OMNI ON, POLY   Mode 2 : OMNI ON, MONO   o : Yes
Mode 3 : OMNI OFF, POLY   Mode 4 : OMNI OFF, MONO   x : No